Meridian/Succession CSE 1000 ITG Line 2.1/i2004 Internet Telephone

Description, Installation, and Operation

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Revision history

June 2001

Standard 1.00.

Contents

Description

Contents

This section contains information on the following topics:

Reference list

The following are the references in this section:

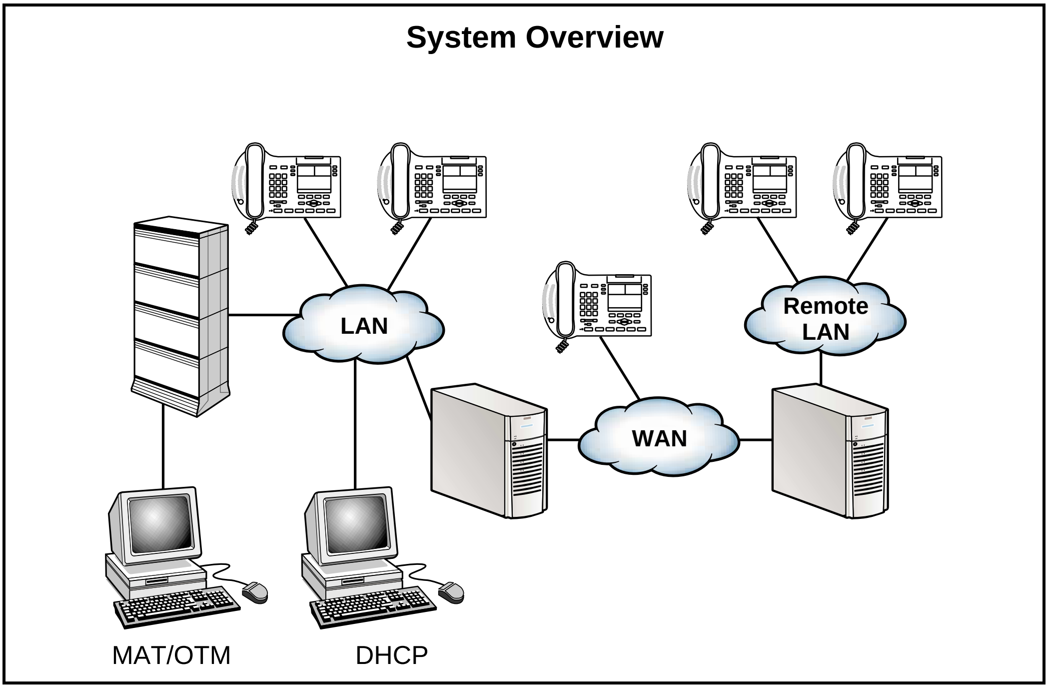
- *X11 Features and Services* (553-3001-306)

Overview

The Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 card supports the i2004 Internet Telephone by providing a communication gateway between the IP data network and the Meridian/Succession CSE 1000. The i2004 Internet Telephone translates voice into data packets for transport using Internet Protocol (IP).

A Dynamic Host Configuration Protocol (DHCP) server can be used to provide required information to enable the i2004 Internet Telephone network connection and connect to the ITG Line 2.1 card. The i2004 Internet Telephone uses the customer's IP network to communicate with the ITG Line 2.1 card and the optional DHCP server. Figure 1 on page 14 shows a system block diagram.

Figure 1
System block diagram



Applicable systems

The ITG Line 2.1 card is supported on Meridian/Succession CSE 1000 systems.

Meridian/Succession CSE 1000 ITG Line 2.1 is not supported on the following products:

- Carrier Remote
- Mini-carrier Remote
- Fiber Remote
- Fiber Remote Multi-IPE

System requirements

The ITG Line 2.1 card requires the following software:

- X11 Release 25.15 or later software
- MAT 6.67.07(with update disk and loss plan patch)/ OTM 1.0 or later

Software delivery

Meridian/Succession CSE 1000 ITG Line 2.1 supports software delivery through a CD-ROM. The CD-ROM is inserted into the CD-ROM drive of the Meridian Administration Tolls (MAT) PC and subsequently downloaded to the ITG Line 2.1 card.

ITG Line 2.1 software and related documentation such as General Release Bulletins can also be downloaded from the Meridian/Succession CSE 1000 Electronic Software Distribution (ESD) web site at:

http://www.nortelnetworks.com/servsup/esd/meridian/

For additional information on registering for access to the Meridian/ Succession CSE 1000 ESD web site, please refer to the Generic X11 Release 25 Software Product Bulletin.

Required packages

The ITG Line 2.1 card and i2004 Internet Telephone require the software packages listed in Table 1.

Table 1
Required packages

Package	Package number
Digital Set Package (DSET)	88
Aries Terminal Package (ARIES)	170

In order to configure ITG Line 2.1 in groups 5 - 7, software package #365, Fiber Network (FIBN) is required.

ITG Line 2.1 and i2004 Internet Telephone package components list

Table 2 lists ITG Line 2.1 package components. Table 3 on page 18 lists the i2004 Internet Telephone package components.

Table 2
Meridian/Succession CSE 1000 ITG Line 2.1 package components

Component	Code
Meridian/Succession CSE 1000 ITG Line 2.1 Systems Package. Includes Meridian/Succession CSE 1000 ITG Line 2.1 NTVQ55AA card assembly and required software licences, ITG Line 2.1 software CD-ROM, cables, Meridian/Succession CSE 1000 ITG-specific 50-pin I/O panel filter connector, NTP CD-ROM	NTZC81AA
Meridian/Succession CSE 1000 ITG Line 2.1 NTVQ55AA card assembly and required software licences for sparing	NTZC80AA A0804145 ***Note:*** These are the order codes for the NTVQ55AA ITG Line 2.1 card.
PC Maintenance cable	NTAG81CA A0655007
E-LAN, T-LAN, RS232 interface cable	NTMF94EA A0783470
ITG-specific 50-pin I/O panel filter connector for Meridian/Succession CSE 1000	NTCW84JA
Package of eight i2004 Internet Telephony User Guide	NTLH45AA A0805445 (P0910804)
Meridian/Succession CSE 1000 ITG Line 2.1 software CD	NTDW80AA A0804147
Meridian/Succession CSE 1000 ITG Line 2.1 card NTP	P0910806
ISM Parameter - For a single i2004 Internet Telephone (Large System)	NTZC82AA A0804340
ISM Parameter - For a single i2004 Internet Telephone (Small System)	NTZC84AA A0808998

Table 3
i2004 Internet Telephone package components

Component	Code
i2004 Internet Telephone Boxed Package. Contains 7 ft. Ethernet cable, i2004 Installation Guide, Power Transformer, Telephone Handset, Telephone Handset Cord, Telephone Footstand.	NTEX00BA B0253074
i2004 Internet Telephone Boxed Package. Contains 7 ft. Ethernet cable, i2004 Installation Guide, Telephone Handset, Telephone Handset Cord, Telephone Footstand.	NTEX00BB
7 ft. Ethernet cable, Category 5	A0648375
Telephone Footstand	P0886045
Telephone Handset Cord	A0788682
Telephone Handset	A0788874
Power Transformer (117/120 VAC 50/60 Hz) (North America only)	A0619627
Power transformer AC to AC, direct plug-in, 8W, 230 VAC, 50/60 Hz, to 16 VAC at 500mA	A0619635
Power transformer 2 prong wall plug, direct plug in AC to AC, 8W 240 VAC, 50 Hz to 16 VAC/500mA	A0647042
Power transformer 3 prong AC to AC, direct plug-in, 8W, 240 VAC, 50 Hz, to 16 VAC/500mA	A0656598

Ordering rules for ITG Line 2.1

An ITG Line 2.1 node requires:

- one NTZC81AA Meridian/Succession CSE 1000 ITG Line 2.1 systems package.
- one NTEX00BA i2004 Internet Telephone boxed package.
- one NTZC80AA, for spare ITG Line 2.1 card

Ordering packages contain 24-port NTVQ55AA ITG Line 2.1 card with required software licences including G.711, G.729AB, G.729B codecs, IP Line 2.0 software and NTP CD-ROM. CD-ROM for upgrades are sold separately.

MAT/OTM is a prerequisite and must be ordered separately. MAT/OTM automatically includes the **ITG IP Phones** application, used to configure, administer, and maintain the Meridian/Succession CSE 1000 ITG Line 2.1 card and i2004 Internet Telephone products.

> ***Note:*** The Alarm and Notification application is not automatically included in MAT/OTM and must be ordered separately.

X11 Release 25 introduces a new ISM system-limit parameter to the existing Meridian/Succession CSE 1000 keycode to enable i2004 Internet Telephone software in the X11 Release 25 software. If you expand ISM limits for the i2004 Internet Telephone, you must order and install a new Meridian/ Succession CSE 1000 keycode. Refer to the Incremental Software Management feature module in the *X11 Features and Services* (553-3001-306) NTP.

ISM parameter

Customers must purchase one NTZC84AA Internet Telephone ISM parameter for each i2004 Internet Telephone to be installed on Meridian/ Succession CSE 1000 (default is zero).

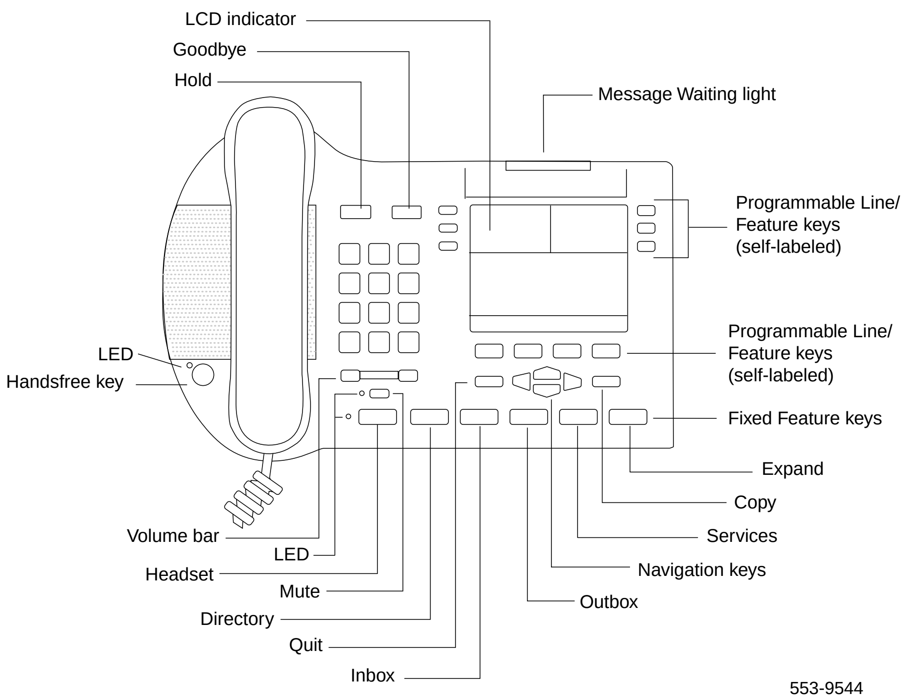
The NTLH45AA Meridian/Succession CSE 1000 i2004 Internet Telephone User Guide is sold separately from the i2004 Internet Telephone. An installation guide is sold with each i2004 Internet Telephone.

No keycode or security device is used on the ITG Line 2.1 card.

i2004 Internet Telephone physical and functional description

The i2004 Internet Telephone translates voice into data packets for transport using Internet Protocol. A Dynamic Host Configuration Protocol (DHCP) server can be used to provide information that enables the i2004 Internet Telephone network connection, and connection to the Internet Telephony Gateway Line 2.0 card. The i2004 Internet Telephone uses the customer's IP network to communicate with the ITG Line 2.1 card and the optional DHCP server. Figure 2 identifies the i2004 Internet Telephone feature keys and other components.

Figure 2
i2004 Internet Telephone components



ITG Line 2.1 card physical description

The ITG Line 2.1 NTVQ55AA card plugs into an Intelligent Peripheral Equipment (IPE) shelf. Each ITG Line 2.1 card occupies two slots.

ITG Line 2.1 cards have an E-LAN management Ethernet port (10BaseT) and a T-LAN VoIP Ethernet port (10/100BaseT) on the I/O panel. There is an RS-232 Maintenance Port connection on the ITG Line 2.1 card faceplate and an alternative connection to the same serial port on the I/O backplane.

> ***Note:*** Do not connect maintenance terminals to both the faceplate and I/O panel serial maintenance port connections at the same time.

ITG Line 2.1 controls, indicators and connectors

Figure 3 on page 22 shows the ITG Line 2.1 card faceplate components. The information in this section describes the components.

Faceplate components

NWK

The faceplate connector labeled NWK is a 9-pin, sub-miniature D-type connector. The connector is not used for the ITG Line 2.1 application.

WARNING

The NWK connector looks like a 9-pin serial connector. DO NOT connect a serial cable or any other cable to it. If you install a cable to the NWK connector, you will disable the T-LAN.

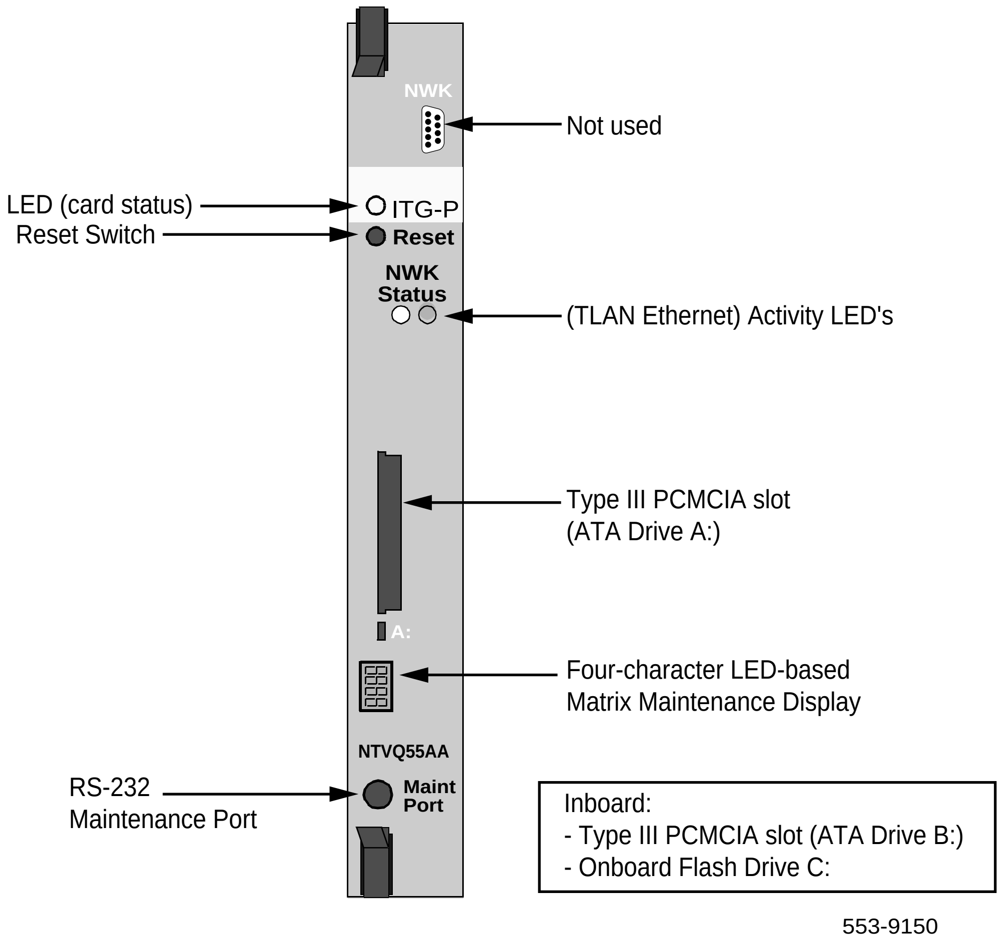
ITG-P LED (Card Status)

The red status faceplate LED indicates the enabled/disabled status of the 24 card ports. The LED is on (red) during the power-up or reset sequence. The LED remains lit until the card is enabled by Meridian/Succession CSE 1000. If the LED remains on, the self-test failed, the card is disabled, or the card rebooted.

Reset switch

Press the Reset switch to reset the card without having to cycle power to the card. This switch is normally used after a card software upgrade to the card or to clear a fault condition.

Figure 3
ITG Line 2.1 NTVQ55AA card assembly



NWK Status LED

NWK Status LEDs display the T-LAN Ethernet activity.

- Green - on if the carrier (link pulse) is received from the T-LAN Ethernet hub.

- Yellow - flashes when there is T-LAN data activity. During heavy traffic, yellow can stay continuously lit.

  Note: There are no Ethernet status LEDs for the E-LAN management interface.

PC Card slots

The ITG Line 2.1 card has one faceplate PC card slot (designated drive A:). It is used for optional maintenance (backup and restore). The ITG Line 2.1 also has one unused inboard slot (designated drive B:). The PC Card slots support PC based hard disks (ATA interface) or high-capacity PC flash memory cards.

Maintenance Display

A four character, LED-based, dot matrix display shows the maintenance status fault codes and other card state information.

RS-232 Maintenance Port (Maint. Port)

The ITG Line 2.1 card faceplate provides a female DIN-8 serial maintenance port connection (labeled Maint Port). An alternative connection to the faceplate serial maintenance port exists on the NTMF94EA I/O panel breakout cable. **Do not** connect maintenance terminals or modems to the faceplate and I/O panel DB-9 male serial maintenance port at the same time.

Backplane interfaces

The backplane connector provides E-LAN, T-LAN, alternate connection to the serial maintenance port DS-30X and Card LAN interfaces.

DS-30X voice/signaling

DS30X carries Pulse Code Modulation (PCM) voice and proprietary signaling on the IPE backplane between the ITG Line 2.1 card and the Intelligent Peripheral Equipment Controller (XPEC).

Card LAN

Card LAN carries card polling and initialization messages on the IPE backplane between the ITG Line 2.1 card and the Intelligent Peripheral Equipment Controller (XPEC).

Assembly description

The ITG Line 2.1 card assembly consists of a two-slot motherboard/daughterboard combination. A PCI interconnect board connects the ITG motherboard and the DSP daughterboard.

ITG Line 2.1 card functional description

The ITG Line 2.1 card performs two separate functions:

1 It acts as a gateway between the Time Division Multiplexing (TDM) voice switching network and the IP network.

2 It acts as Terminal Proxy Server (TPS) or "virtual line card" for the i2004 Internet Telephone.

The TPS portion of the cards connect through the E-LAN port to the Meridian/Succession CSE 1000 CPU through the CPU Ethernet port. The Gateway portion of the card connects to the Meridian/Succession CSE 1000 through the DS30X backplane. The Gateway portion also receives call speech path setup and codec selection commands through the E-LAN port. The i2004 Internet Telephone connects to both the Gateway and TPS functions through the T-LAN port.

Gateway functional description

The Gateway:

- Registers with the PBX using the TN Registration messages
- Accepts commands from the PBX to connect/disconnect audio channel
- Uses RTP/RTCP protocol to transport audio between the gateway and the i2004
- Encodes/Decodes audio from PCM to/from i2004’s format
- Provides echo cancellation for the speaker on the i2004

Virtual TNs

Virtual TNs (VTNs) allow you to configure service data for a terminal, such as key layout and class of service, without requiring a physical terminal to be directly connected to the PBX.

The concentration of i2004s Telephones is made possible by dynamically allocating a port (also referred to as a Physical TN) of the ITG card for a TDM – i2004 call. All Meridian/Succession CSE 1000 speech path management is done with Physical TNs instead of the Virtual TNs.

The choice of the port is not restricted to the ITG where the TPS handling that particular i2004 is running. The port can be chosen among all the ITGs dedicated to i2004s. The i2004s (Virtual TNs) are defined on Virtual superloops.

A virtual superloop is a hybrid of real and phantom superloops. Like phantom superloops, no hardware (for example, XPEC or line card) is used to define and enable units on a virtual superloop. As with real superloops, virtual superloops use the time slot map to handle i2004 Internet Telephone (Virtual TNs) to i2004 Internet Telephone calls.

Terminal proxy server (TPS) description

The TPS maintains a count of the number of sets registered to the card. Each node has one active master. The active master broadcasts to all ITG cards requesting a response if it has room for another set. 96 is the maximum number of sets per card.

The Election function uses a selection process to determine the node's master.

The Census function determines the ITG cards within a node.

Virtual Terminal Manager (VTM) description

The Virtual Terminal Manager:

- arbitrates application access to the i2004s.
- manages all the sets between the applications and the stimulus messaging to the set.
- maintains context sensitive states of the set (for example, display or lamp state).
- isolates set-specific information from the applications (for example, the number of display lines, number of characters for each display line, tone frequency and cadence parameters).

Interactions with i2004 Internet Telephone

When you add an i2004 Internet Telephone to the network, the telephone sends a request to the DHCP server identifying itself as an i2004 Internet Telephone and requests IP parameters and a Connect Server address. The i2004 Internet Telephone then contacts the Connect Server which instructs the i2004 Internet Telephone to display a message on its display screen requesting the customer's node number and TN.

After the customer enters this information, the i2004 Internet Telephone contacts the Node Master which selects a TPS with sufficient capacity to register the i2004 Internet Telephone. The chosen TPS contacts the i2004 Internet Telephone, and if the i2004 Internet Telephone is valid, registers it with the Meridian/Succession CSE 1000. The registration information is then saved to the i2004 Internet Telephone.

Unregistration

If the ITG Line 2.1 card detects a loss of connection with one of its registered i2004 Internet Telephones, it logs the event and sends an unregister message to the Meridian/Succession CSE 1000 for that i2004 Internet Telephone.

Codecs

Codec refers to the voice coding and compression algorithm used by the DSPs on the ITG Line 2.1 card. Different codecs provide different levels of voice quality and compression properties. The specific codecs used and the order in which they are to be used, is configured in the TPS and Meridian/ Succession CSE 1000.

The ITG Line 2.1 card supports the G.711, G.729A and G.729AB codecs.

Signaling and messaging

The ITG Line 2.1 sends SSD messages through the Meridian/Succession CSE 1000 E-LAN using the UDP protocol. When tone service is provided, it is signaled to the TPS using new SSD messages sent through the E-LAN.

Signaling protocols

Signalling between the i2004 Internet Telephone and the ITG Line 2.1 card uses the Unified Networks IP Stimulus Protocol (UNIStim) with the Reliable User Datagram Protocol (RUDP) as the transport protocol.

RUDP

Reliable User Datagram Protocol (RUDP) is used for E-LAN communications between the Meridian/Succession CSE 1000 CPU and the ITG Line 2.1 cards, and for T-LAN communications between the ITG Line 2.1 cards and the i2004 Internet Telephones. RUDP is another layer on top of UDP. RUDP is proprietary to Nortel Networks.

RUDP features:

- Reliable communication system over a network
- Packages are resent if an ACK is not received following a time-out
- Messages arrive in the correct sequence
- Duplicate messages are ignored
- Loss of contact detection

When a data sequence is packetized and sent from source A to receiver B, the RUDP protocol adds a number to each packet header to indicate its order in the sequence.

- If the packet is successfully transmitted to B, B sends back a ACK (acknowledge) message to A, acknowledging that the packet has been received.
- If A receives no message within a configured time, it retransmits the packet.
- If B receives a packet without having first received its predecessor, it discards the packet and all subsequent packets, and sends A a NAK (no acknowledge) message which includes the number of the missed packet. A retransmits the missed packet and continues from there.

UNIStim description

The Unified Network IP Stimulus Protocol (UNIStim) is the single point of contact between the various server components and the i2004 Internet Telephone.

UNIStim is the stimulus-based protocol used for communication between an i2004 Internet Telephone and a Terminal Proxy Server on the ITG Line card.

Zones

To optimize ITG traffic bandwidth use between different locations, the ITG network is divided into “zones" representing different topographical areas of the network. All i2004 Internet Telephone and ITG ports are assigned a zone number indicating which zone they belong to. When a call is made, the codecs used vary depending on which zone(s) the caller and receiver are in. By default:

- Connections between units in the same zone will select codecs to optimize voice quality (BQ).
- Connections between units in different zones will select codecs to optimize voice quality (BQ).

Each zone can be configured to optimize either voice quality or bandwidth usage for calls between users in that zone. Each zone can be configured to optimize either voice quality or bandwidth usage within a zone and all traffic going out of a zone. See “IP Voice zones” on page 65.

Administration

The ITG Line 2.1 card provides two management interfaces:

- A Graphical User Interface (GUI) provided by MAT 6.67.07 or OTM 1.0, (or later).
- A Command Line Interface (CLI).

  Note: You can also perform some maintenance tasks on the ITG Line 2.1 using Overlay 32 and other Meridian/Succession CSE 1000 Overlays.

MAT ITG - IP Phones application

You must use MAT/OTM to create a node, add cards to the node, transmit software to the cards, upgrade software, define SNMP alarms, Codecs and other related tasks.

Command Line Interface

The ITG Command Line Interface (CLI) provides a text-based interface to perform some specific ITG Line 2.1 card installation, configuration, administration, and maintenance functions. You can establish a CLI session by connecting a TTY or PC to the card serial port or Telnet via the E-LAN or T-LAN IP address.

With a CLI session established, you can enter the Leader card IP address. MAT/OTM uses the card IP address to carry out configuration and software download functions.

Supported features

The i2004 Internet Telephone supports the full Meridian/Succession CSE 1000 digital set feature compliment available on the M2000 series telephones.

Feature highlights include:

- Multi Line
- 6 self-labelled programmable line/feature keys. One must be the DN key.
- 6 icon-labelled fixed feature keys
- 4 self-labelled programmable feature keys provide access to multiple features
- Handsfree with LED
- Dual purpose LED indicator: Message waiting (solid), Incoming call (flashing)
- Navigation cluster (up/down, left/right)
- Direct connect headset port

Physically the i2004 Internet Telephone is very similar to the M3900 digital telephone, however it is important to note that there are distinct differences between the two sets.

Similarities between the M3900 and the i2004 Internet Telephone

Self-labelled keys

The M3900 series portfolio contains a new feature that eliminates paper labelled keys. Line and feature keys are now "self-labelled". This means that once the phone is configured within the system, the line and feature key labels are automatically presented to the user through the display. This significantly reduces the initial installation and designation time. It also reduces ongoing maintenance charges associated with re-designation when programming changes occur or new feature are added.

Self-labelled keys are also delivered on the i2004 Internet Telephone. This feature is further simplified on the i2004 Internet Telephones because it is not necessary to physically connect the telephone back to a specific hardware port on a line card.

ACD feature set

The i2004 Internet telephone supports the ACD feature set of Meridian/ Succession CSE 1000. There are specific limitations that should be noted if you are using the set in an ACD environment:

- There are six feature keys that can be configured for ACD functionality (one of ACD in-calls and five others)
- The headset does not support the ACD Walkaway feature. If the headset in unplugged, ACD Walkaway is not invoked.

Differences from the M3900 set

Some of the new features available on the M3900 series are not currently supported on the i2004 Internet Telephone.

Specific M3900 features **not** available on the i2004 Internet Telephone include:

- Personal Directory
- Call Log and redial List
- Expansion Modules
- Support of accessory modules
- User customizable feature keys

- Live Dial pad
- Group Listening
- Shift key for six additional feature keys
- Set to set messaging
- Hot desking
- Context sensitive soft keys

i2004 Internet Telephone dedicated keys

Table Note: describes the specific telephone assignment functions you can program for Keys 16-26 on the i2004 Internet Telephone using Overlay 11.

> ***Note:*** If you attempt to configure anything other than the permitted response, Meridian/Succession CSE 1000 generates an error code.

Table 4
i2004 Internet Telephone dedicated key assignments (LD 11)

i2004 Internet Telephone key number	Response(s) Allowed
Key 16	MWK, NUL MWK - Message Waiting key
Key 17	TRN, NUL TRN - Call Transfer key.
Key 18	A03 or A06, NUL AO3 - 3-party conference key AO6 - 6-party conference key
Key 19	CFW, NUL CFW - Call Forward key.
Key 20	RGA, NUL RGA - Ring Again key.
Key 21	PRK, NUL PRK - Call Park key.

Table 4
i2004 Internet Telephone dedicated key assignments (LD 11) (Continued)

i2004 Internet Telephone key number	Response(s) Allowed
Key 22	RNP, NUL RNP - Ringing Number pickup key
Key 23	SCU-Speed Call User SSU-System Speed Call User SCC - Speed Call Controller SSC - System Speed Call Controller NUL
Key 24	PRS, NUL PRS - Privacy Release key.
Key 25	CHG, NUL CHG - Charge Account key.
Key 26	CPN, NUL CPN - Calling Party Number key.

About this document

This document describes the physical and functional characteristics of the Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 (NTZC80) card and the i2004 Internet Telephone (NTEX00). The document also explains how to engineer, install, configure, administer, and maintain a network node that contains the ITG Line 2.1 card and the i2004 Internet Telephone in Meridian/Succession CSE 1000 systems.

Meridian/Succession CSE 1000 capacity engineering guidelines

Contents

This section contains information on the following topics:

Overview

This chapter provides capacity engineering guidelines to help plan and engineer Meridian/Succession Communication Server for Enterprise (CSE) 1000 to support the Meridian/Succession CSE 1000 Internet Telephony Gateway (ITG) Line 2.1 card and the i2004 Internet Telephone. The section includes hardware and software requirements, product compatibility information, electrical and environmental specifications, and a description of the IP address requirements.

Refer to “IP Network engineering guidelines” on page 55 for IP Network Engineering information.

Refer to “ITG MAT 6.67.07 (with update disk and loss plan patch)/OTM 1.0 setup on PC” on page 159 for information on how to configure Meridian Administration Tools/Optivity Telephony Management (MAT/OTM) 1.0 to support the ITG Line 2.1 card and the i2004 Internet Telephone.

Refer to “Configuration of the DHCP server” on page 97 for engineering guidelines to set and configure the Dynamic Host Configuration Protocol (DHCP) server to support the ITG Line 2.1 card and i2004 Internet Telephone.

Capacity engineering considerations

There are restrictions on the number of i2004 Internet Telephones that can be installed on certain system types. These limits result from the time required to re-register all of the i2004 Internet Telephones after the Meridian/Succession CSE 1000 initializes. Please refer to the Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 and i2004 Internet Telephone Product Bulletin or the Read Me First document for more information.

> ***Note:*** The average number of Busy Hour Call Attempts should not exceed an average of 1200 BHCA per hour.

X11 system software requirements

The ITG Line 2.1 and i2004 Internet Telephone requires X11 Release 25.15 software (or later). Table 5 lists the X11 software package requirements.

Table 5
X11 software package requirements

Package mnemonic	Package number	Package description
DSET	88	Digital set package
ARIES	170	Aries terminal package

MAT version requirements

The ITG Line 2.1/i2004 Internet Telephone product requires MAT 6.67.07(with update disk and loss plan patch)/OTM 1.0 (or later). Refer to "ITG MAT 6.67.07 (with update disk and loss plan patch)/OTM 1.0 setup on PC" on page 159 for specific MAT requirements.

ISM limits

ISM parameters

Customers must purchase one NTZC84AA Internet Telephone ISM parameter for each i2004 Internet Telephone installed on small systems. The default is zero. A new ISM parameter uses the existing Meridian/Succession CSE 1000 keycode to enable i2004 Internet Telephone software in the X11 Release 25 software. If you expand ISM limits for the i2004, you must order and install a new keycode. Refer to the ISM feature module in the 553-3001-106.

i2004 Internet Telephone firmware requirements

The i2004 Internet Telephone has field upgradeable firmware. A copy of this firmware is stored on each ITG Line 2.1 card in the system to automatically upgrade i2004 sets if an upgrade is required. All i2004 Internet Telephones in a system **must** use the same version of firmware as the ITG Line 2.1 card.

Firmware Upgrade from a new ITG Line 2.1 card

When the ITG Line 2.1 card is received from the factory, it has the latest i2004 firmware already installed in the /C:/FW directory. As each i2004 Internet Telephone comes on-line, its firmware version is automatically compared to the version that is stored on the ITG Line 2.1 card. If they are different, a process is started which downloads the new firmware from the ITG Line card to the i2004 Internet Telephones. After the new firmware has been downloaded, the i2004 reboots and registers again with the ITG Line 2.1 card.

Firmware Upgrade of an ITG Line 2.1 card

It is possible to upgrade the i2004 Internet Telephone firmware in the field:

1 Download the firmware directly from the Meridian/Succession CSE 1000 Electronic Software Documentation (ESD) web site to the MAT or OTM PC. Refer to Procedure 17, “Upgrade i2004 Internet Telephone firmware” on page 157 for step-by-step instructions.

2 Transmit the firmware file to each ITG Line 2.1 card.

Note 1: Before you attempt to transmit "Etherset firmware"**,** that is, the i2004 Internet Telephone firmware, the ITG Line 2.1 card must establish a signalling link with the Meridian/Succession CSE 1000 call server via the E-LAN

Note 2: Transmit firmware upgrade to all cards before proceding to the last step

3 Select each ITG Line 2.1 card in turn. Telnet to the card and upgrade the i2004 Internet Telephones with the latest firmware file downloaded form the web. Commands are available to upgrade a single i2004 Internet Telephones immediately, all i2004 Internet Telephones immediately, or schedule all i2004 Internet Telephones to be upgraded at a later time.

> IMPORTANT
>
> Refer to Procedure 17 on page 157 at this point, for the actual steps required to complete this firmware installation. There is **some risk** involved which can result in taking all the i2004 Internet Telephones inadvertently out of service.

Note: The i2004 Internet Telephone will not necessarily register with the same card as before the upgrade occurred.

Make note of the following caveats:

- The i2004 Internet Telephone is shipped from the factory with sufficient firmware to complete the initial download.

- The firmware is downloaded to the i2004 set if it is different, which means that it is possible to download an older version of the firmware.
- The i2004 Internet Telephone uses trivial file transfer protocol (TFTP) to transfer the firmware, therefore the customer's network must support TFTP. For example, the customer's network cannot be blocked by a firewall.

System Resources

This section explains how to calculate Meridian/Succession CSE 1000 system capacity when engineering the ITG Line 2.1/i2004 Internet Telephone.

ITG capacity

Table 6 lists the System ITG capacity for cards, sets, and gateway ports.

Table 6
System ITG capacity

Parameter	Capacity
ITG cards per system	Each card requires two slots (subject to EMC restriction, see "Electromagnetic Compatibility requirements" on page 45)
i2004 Internet Telephone per card	Maximum of 96 sets supported per card.
Gateway ports per card	Maximum of 24 IP to TDM gateway ports per card. Subject to codecs used.

Capacity engineering considerations

- Number of sets per system:
  - Option 11C or 11C Mini - 640
  - Large Systems - limit is determined by engineering of real time usage, traffic capacity, network loop usage and IPE slot usage.
    - For normal traffic engineering, provision up to 1024 i2004 virtual TN's per virtual superloop.

– For a non-blocking virtual superloop configuration, do not exceed 120 i2004 virtual TN's per virtual superloop.

Note: In Large Systems, virtual superloops contend for the same range of loops with phantom, standard, and remote superloops, digital trunk loops and all service loops.

- Maximum ITG cards running i2004 application in system:
  - Eight ITGs maximum in Option 11C or 11C MiniC
  - In all large systems (Option 51-81C) maximum ITG card limit is determined by IPE slot usage.
  - Maximum of 96 i2004 Internet Telephones per ITG Line 2.1 card. Refer to "Traffic capacity of ITG cards when supporting i2004 Internet Telephones" on page 40
- Option 11C: Maximum of five Virtual superloops, 96 - 112 with Cards 61-80 (640 sets)

Note: Virtual superloops, Phantom superloops, and Real superloops contend for the same five superloops in small systems.

Traffic capacity of ITG cards when supporting i2004 Internet Telephones

Each ITG Line 2.1 card has 24 ports that are used for establishing a voice connection between i2004 Internet telephones and non-Internet Telephones, such as digital telephones or public network. To configure a system as non-blocking (as is typically the case for ACD configurations), ensure only 24 i2004 Internet Telephones per card are registered.

A registered set is not synonymous with a configured set. When a set is registered it is a though the set is plugged in. When the set de-registers, it is as though the set was unplugged. Registration consists of two steps:

- verifying the user's TN is valid and not yet registered
- associating the TN on the Meridian/Succession CSE 1000 side.

If an i2004 Internet Telephone is unplugged, it will automatically become un-registered after a pre-determined time-out. This limitation on simultaneous calls depends not on the number of ports, but on the number and type of calls.

A call between two i2004 Internet Telephones on the same Meridian/ Succession CSE 1000 ITG Line 2.1 node does not use the ITG line card as a voice path across the data network.

ITG Line 2.1 cards in a Meridian/Succession CSE 1000 are pooled resources assigned dynamically. An i2004 Internet telephone can be assigned any port of any ITG Line 2.1 card within the Meridian/Succession CSE 1000 system.

Refer to the following three examples for further clarification:

Example 1:

150 sets with "typical" business usage of 6 CCS* per set on average (e.g. 5 calls of 120 seconds duration per hour)

— 150 x 6 CCS = 900 CCS

— 2 ITGs required (see Table 7 on page 42)

Example 2:

500 sets with "heavy" business usage of 12 CCS per set on average (e.g. 6 -7 calls of 180 seconds duration per hour)

— 500 x12 CCS = 6000 CCS

— 8 ITGs are required (see Table 7 on page 42 - eight ITGs support up to 6013 CCS)

Example 3:

48 Call Center Agents with allocation of 36 CCS per set

— 2 ITGs are required (48 ports required/24 ports per ITG card = 2 ITG cards)

Note: For Call Center Agents, it is recommended that one ITG port be provisioned for each agent.

*CCS = The number of hundreds of call seconds per hour.

i2004 Set Engineering

Traffic and Service Circuits

Virtual Loops use software resources for tracking speech path traffic usage and Call Detail Recording. There are 120 of these resources per Virtual Loop. As a result, i2004 sets are engineered similar to existing digital sets (based upon 3500 CCS per Virtual Loop). TDS/Conference circuits are provisioned like existing digital sets (one TDS/CONF card per half group of i2004 sets).

Configure no more than 5 ITG Line 2.1 cards per superloop to eliminate the possibility of blocking due to insufficient talkslots (For example, 5 ITGs x 24 ports = 120 talkslots). Use the following table to determine the number of ITG Line 2.1 cards required to maintain the recommended capacity:

Table 7
ITG card recommendations based on CCS capacity

i2004 Internet Telephone blocking probability is 0.005	
Number of ITG cards	**Capacity CCS**
1	511
2	1232
3	1996
4	2780
5	3577
6	4383
7	5196
8	6013
9	6835
10	7660
11	8488
12	9318

Table 7
ITG card recommendations based on CCS capacity

i2004 Internet Telephone blocking probability is 0.005	
Number of ITG cards	**Capacity CCS**
13	10144
14	10983
15	11818
16	12657
17	13496
18	14335
19	15177
20	16020

Note 1: CCS is the number of hundred call seconds per hour

Note 2: If the number of ITG Line 2.1 card exceeds 20, add 801 CCS to the total capacity for each additional card.

Real time factors

The real time factors for i2004 Internet Telephones is given in Table 8 on page 43.

Table 8
Real time factors for i2004 Internet Telephones

Call scenario	Real time Factors
1 - way inbound	0.78
1 - way outbound	1.59
2- way	2.95

The total real time capacity of the Meridian/Succession CSE 1000 depends on factors such as:

- calling patterns
- feature operations
- set and trunk signalling
- system CPU capacity

These factors are used to provision the maximum number of i2004 Internet Telephones supported on specific Meridian/Succession CSE 1000 system types. These factors also describe the impact of using i2004 Internet Telephones relative to real time usage for a basic call between two 2500 sets. Please refer to *Capacity Engineering* (NTP 553-3001-149 for further information.

Specifications

This section lists electrical, environmental, and Electro-Magnetic Containment (EMC) requirements of the ITG Line 2.1 card and the i2004 Internet Telephone.

i2004 Internet Telephone power requirements

The i2004 Internet Telephone is powered by a 16 V ac, 500 mA from a local transformer. Line voltage is different for each country. The i2004 Internet Telephone also accommodates a 48 V dc supply. Power is applied by a “barrel” connector.

The NTEX00BA ships with a 117/120 VAC transformer for North America. The NTEX00BB does not include a transformer. You must order an NTxxxxxx transformer, depending on the country.

ITG Line card power consumption

The worst case current drawn by the ITG Line 2.1 card from each Backplane voltage supply is:

$\pm$ 15 volt = 19.3 watts => 0.640 amps

+5 volt = 10.5 watts => 2.1 amps

Environmental specifications

Table 9 shows the environmental specifications of the ITG Line 2.1 card. The ITG line card provides external interface protection to -52 V dc, but does not provide lightning or hazardous voltage protection. Table 10 shows the environmental specifications of the i2004 Internet Telephone.

Table 9
ITG Line 2.1 card—environmental specifications

Parameter	Specifications
Operating temperature	0° to +60° C (+32 to +140° F), ambient
Operating humidity	5 to 95% RH (non-condensing)
Storage temperature	–40° to +70° C (–40° to +158° F)

Table 10
i2004 Internet Telephone—environmental specifications

Parameter	Specifications
Operating temperature	-20° to +50° C, ambient
Operating humidity	+30° / 95% RH (29 g/m3 mean absolute humidity)
Storage temperature	–40° to +70° C

Electromagnetic Compatibility requirements

Electro-Magnetic Containment (EMC) compliance requirements depend on the regulations in effect for the country where the Meridian/Succession CSE 1000 is located. CISPR 22 Class B defines more stringent EMC limits than CISPR 22 Class A requirements (that is, equipment that meets CISPR 22 Class B exceeds CISPR 22 Class A requirements and can be used globally).

The ITG 2.0 Line card is approved for CISPR 22 Class A (and FCC Part 15 Class A) limits and approved to CISPR 22 Class B limits.

IP address requirements for the Line 2.0 card

This section describes the IP address requirements for each node, for each card, and for each i2004 Internet Telephone.

A node is a group of ITG Line 2.1 cards. Each card within a node has two IP addresses - one for the telephony LAN (T-LAN) and one for the Meridian/ Succession CSE 1000 imbedded LAN (E-LAN). Each node has one Node IP address, on the T-LAN, which is dynamically assigned to the connection server on the node master. The i2004 Internet Telephone uses the Node IP address during the registration process.

All E-LAN addresses for all nodes must be on one subnet. All E-LAN addresses must be on the same subnet as the Meridian/Succession CSE 1000 Core E-LAN. All T-LAN addresses must be in the same subnet for a given node.

Node IP requirements.

> IMPORTANT
> You **must** use separate subnets with the ITG Line 2.1/i2004.

The default setting of separate E-LAN and T-LAN subnets offers the following features:

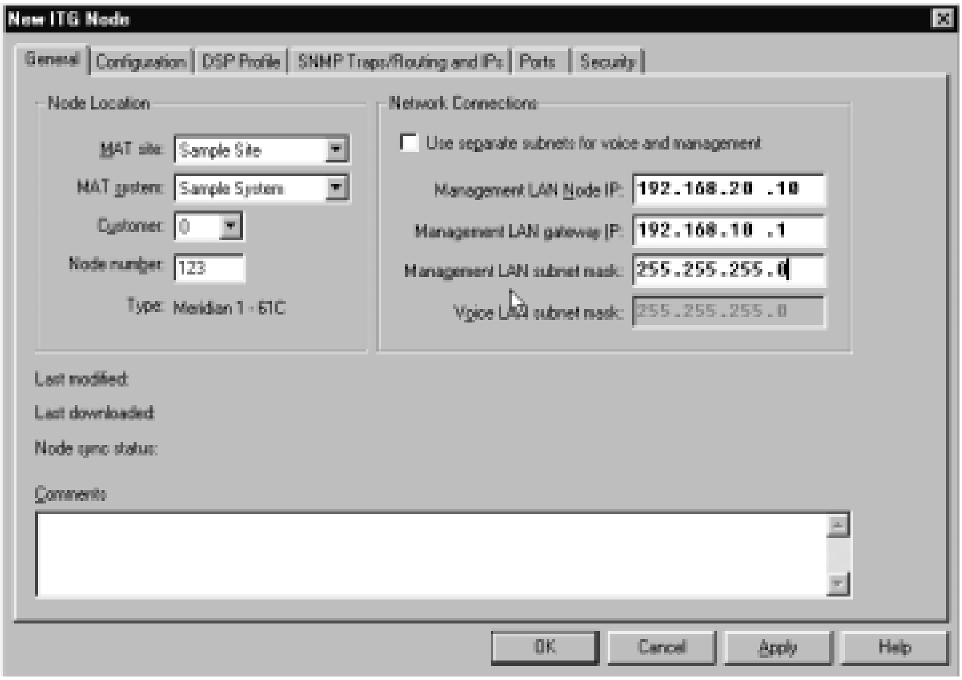
- Separate subnets are easier to configure for traffic management and QoS.
- Separate subnets protect the Meridian/Succession CSE 1000 E-LAN from general LAN traffic, including broadcast storms
- Separate subnets are more secure against unauthorized access

Separate subnet Node IP address requirements

Figure 4 on page 47 shows an example of the ITG Node General tab with IP addresses configured for separate subnets. You must accept the default configuration of separate subnets. The terms in the bullet list below are the terms used to define the fields in the MAT/OTM application.

- Voice LAN Node IP address - The Voice LAN is also called the Telephony LAN (T-LAN). This alias IP address appears dynamically on the T-LAN port of one card in the node, the Leader or node master.
- Management LAN gateway IP address - The Management LAN is also called the Embedded LAN (E-LAN)
- Management LAN subnet mask
- Voice LAN subnet mask

Figure 4
Node IP address requirements example (separate subnets)



ITG Line 2.1 card IP address requirements

The IP address information for each card is set in the **Configuration** tab of the ITG IP Phones application. The IP address requirements for each card depend on the Node subnet option.

You must provide an IP address for an E-LAN and T-LAN port. On the E-LAN, all cards must be on same subnet, which is the same subnet the Meridian/Succession CSE 1000 is connected to. On the T-LAN, all cards in a node must be on the same subnet.

The Management MAC is set in the factory. Use the MOTHERBOARD Ethernet address (E-LAN address) on the faceplate sticker on each ITG Line 2.0 card.

Separate subnet ITG Line 2.1 card IP address requirements

You must use separate subnets for the ITG Line 2.1 Node (see Figure 4 on page 47), each ITG Line 2.1 card requires a:

- Management IP address
- Voice IP address
- Management MAC
- Voice LAN gateway IP address

i2004 Internet Telephone IP address requirements

Each i2004 Internet Telephone requires an IP address, subnet masks, and default IP gateway (router) for the i2004 Internet Telephone LAN segment. See “Requested Network Configuration Parameters” on page 102 for detailed information on i2004 Internet Telephone network address requirements and related network parameters.

Equipment considerations

This section lists optional and required equipment that can be used to install, configure, and maintain the ITG Line 2.1 card and i2004 Internet Telephone products.

Optional equipment

- A server configured with Dynamic Host Configuration Protocol (DHCP). For example, you can use a Nortel NetID server.
- External modem router (recommended Bay Networks Netgear RM356) to allow remote dial-up connection to E-LAN for technical support.

Required equipment

- PC with MAT version 6.67.07 (with update disk and loss plan patch)/ OTM 1.0 (or later) installed. Turn to “ITG MAT 6.67.07 (with update disk and loss plan patch)/OTM 1.0 setup on PC” on page 159 for MAT PC configuration information.
- Local TTY or terminal in switchroom - required for leader 0 configuration
- Shielded CAT 5 Ethernet cables to connect ITG Line 2.1 card to external hub equipment
- 10/100-Base-T Ethernet port (optional auto-sensing) to support T-LAN and 10BaseT E-LAN network connections
- 10/100-Base-T Ethernet port (optional auto-sensing) in each location an i2004 Internet Telephone resides.
- Serial cables

ITG-specific I/O filter connectors

For Meridian/Succession CSE 1000, the standard IPE module I/O filtering is provided by the 50-Pin filter connectors mounted in the I/O Panel on the back of the IPE shelf. The filter connector connects externally to the MDF cables and internally to the NT8D81AA Backplane to I/O Panel ribbon cable assembly.

For 100BaseTx T-LAN operation, the standard I/O filter connector must be replaced with the NTCW84JA ITG-specific I/O filter connector for the leftmost of the two card slots occupied by the NTVQ55AA ITG Line 2.1 card.

For Option 11C or 11C Mini systems, the standard I/O filter connector already supports 100BaseTX T-LAN operation. Refer to “Install NTCW84JA ITG-specific I/O Panel Filter Connector for Large System” on page 115 for installation instructions.

CAUTION

For Meridian/Succession CSE 1000 manufactured during the period of 1998-1999 and shipped in North America, the IPE modules have the NT8D81BA Backplane to I/O Panel ribbon cable assembly with a non-removable Filter Connector. The NT8D81BA is compatible with 10BaseT T-LAN, but if you require a 100 Base TX T-LAN, you need to order and install the NT8D81AA Backplane to I/O Panel ribbon cable assembly. **Do not** try to install the NTCW84JA Filter Connector onto the existing non-removable Filter Connector.

If required for your site, turn to See “Replace cable NT8D81BA with NT8D81AA” on page 243.

Identify the IPE card slots

Identify the IPE card slots selected for ITG Line 2.1 card.

Table 11
ITG installation by module type

Meridian/Succession CSE 1000 Modules	ITG Card Slots
NT8D37BA/EC IPE modules, NT8D11BC/ED CE/PE modules	All available IPE card slots.
NT8D37AA/DC IPE modules	0, 4, 8, and 12
NT8D11AC/DC CE/PE modules	0

Product compatibility with other ITG products

Nortel Networks manufactures three Voice Over IP (VoIP) products in addition to ITG Line 2.1. This section explains how the ITG Line 2.1 card relates to the ITG products listed below:

- Meridian/Succession CSE 1000 Internet Telephony Gateway Line 1.0 card/IP Telecommuter
- Meridian/Succession CSE 1000 Internet Telephony Gateway Trunk 1.0 card/Basic per-trunk signaling
- Meridian/Succession CSE 1000 Internet Telephony Gateway Trunk 2.0 card/ISDN Signaling Link

All cards within a node must be on the same subnet. Each ITG product uses T-LANs and E-LANs that can co-exist with each other. All cards within a node must be on the same subnet. They can share the same T-LANs, and must share the same E-LAN. You need to engineer the traffic on the T-LAN to consider all ITG applications.

For EMC compliance, add up all the ITG products to stay within EMC limits. The ITG cards all require two slots in a module or cabinet.

Meridian/Succession CSE 1000 IP Telecommuter is an H.232 application and requires a separate line card. All ITG applications require their own card.

Virtual superloops, virtual TNs and physical TNs

Virtual TNs allow configuration of service data for an i2004 terminal, such as key layout and class of service, without requiring the i2004 Internet Telephone physical terminal to be dedicated (hard-wired) to a given TN on the Meridian/Succession CSE 1000 ITG Line 2.1 card. Calls are made between an i2004 Internet Telephone and traditional sets/trunks using the full Meridian/Succession CSE 1000 feature set. DSP channels are allocated dynamically for this type of call to perform the transcoding required to connect the i2004 Internet Telephone to the TDM network.

A new type of superloop (a virtual superloop) is introduced in X11 Release 25.15 to support i2004 Internet Telephone configuration. To create i2004 Internet Telephones through the use of VTNs, you must create a virtual superloop in Overlay 97. Up to 1024 VTNs can be configured on a single virtual superloop for a large system. Up to 128 VTNs can be configured on a single virtual superloop for a small system, leading to a maximum number of 640 VTNs per small system.

Each ITG Line 2.1 card provides 24 physical TNs. You configure the ITG physical TN's (IPTN) in Overlay 14. They appear as tie trunks without a route data block.

ITG card CPU resources

The i2004 Internet Telephones share the CPU resources of the ITG cards. Each i2004 Internet Telephone is controlled by one of the ITG Line 2.1 cards. Up to 96 i2004 Internet Telephones can be registered with a single ITG card.

i2004 Internet Telephones can call other i2004 Internet Telephones like any other telephone on the Meridian/Succession CSE 1000. In i2004-to-i2004 calls, the voice media stream is carried by IP packets directly between the sets over the IP network.

On a traditional telephone, the tones are generated by Meridian/Succession CSE 1000. The i2004 Internet Telephone can generate tones that originate on the original switch, so the tones do not suffer from distortion caused by compression codecs such as G.729A.

Codecs

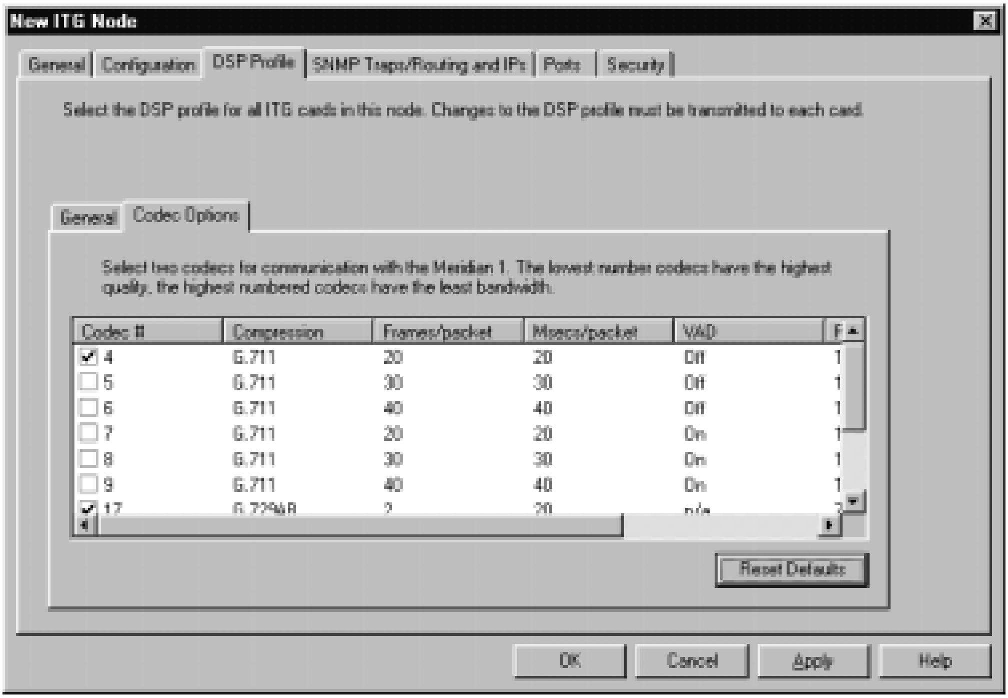
The i2004 Internet Telephone and ITG Line 2.1 card support different codecs and codec parameters with different compression rates and audio quality. The Meridian/Succession CSE 1000 selects the appropriate codecs based on user-configurable parameters. For instance, within a LAN an i2004 Internet Telephone-to-i2004 Internet Telephone call can be set up using G.711 at 64 Kbps. For an i2004 Internet Telephone-to-i2004 Internet Telephone call over a WAN, the call can be set up using G.729B at 8 Kbps. These data routes are for the voice stream only. Packet overhead is not included.

The Terminal Proxy Server (TPS) and Meridian/Succession CSE 1000 have a predefined table of up to 32 codec option sets that can be supported. The first entry in the table has the highest quality audio, (BQ = Best Quality), and requires the largest bandwidth. The last entry requires the least bandwidth, (BB = Best Bandwidth), with some sacrifice in voice quality.

When an i2004 Internet Telephone or gateway DSP sets up a RTP voice connection, it determines which of the codecs it supports. This information is provided to the Meridian/Succession CSE 1000 as part of the i2004 Internet Telephone registration sequence. For more information about the registration sequence, turn to “Configuration of the DHCP server” on page 97. The Meridian/Succession CSE 1000 uses this information to set up a speech path to select a Codec that both endpoints support. As part of zone management, it further selects the Codec based on whether it is trying to optimize quality (BQ) or bandwidth (BB).

When you configure the ITG Line 2.1 card, you select two codecs - a high-quality (BQ) Codec and a bandwidth-efficient (BB) Codec. Figure 5 on page 54 shows the list of supported codecs. The ITG Line 2.1 product supports A-law and Mu-law.

Figure 5
Codec Options (default selection)



IP Network engineering guidelines

Contents

This section contains information on the following topics:

Overview

This chapter provides guidelines and recommendations to help plan, engineer, and test the ITG Line 2.1 card/i2004 Internet Telephone network.

The following procedures are contained within this chapter:

- Procedure 1, "Network assessment procedure" on page 56
- Procedure 2, "T-LAN traffic calculation procedure" on page 60
- Procedure 1, "WAN traffic calculation procedure" on page 63
- Procedure 2, "Link utilization assessment procedure" on page 66

See "Configuration of the DHCP server" on page 97, for engineering guidelines to set and configure the Dynamic Host Configuration Protocol (DHCP) server to support the ITG Line 2.1 card and i2004 Internet Telephone.

IP network assessment procedure

An efficient ITG network design begins with an understanding of traffic and the underlying network that carries the traffic. The following procedure summarized the steps the technician must perform to determine the network requirements of the specific system.

Procedure 1
Network assessment procedure

1 Estimate the amount of traffic that the Meridian/Succession CSE 1000 will process via the ITG network. See "Calculate ITG traffic requirements" on page 57.

2 Assess whether the existing corporate intranet can adequately support voice services. See "Calculate ITG traffic requirements" on page 57 and, "Assess WAN link resources" on page 62.

3 Organize the ITG network into "zones" representing different topographical areas of the network that are separated according to bandwidth considerations. See "IP Voice zones" on page 65.

4 Set a variety of service parameters to improve service and coordinate (with the IP administrator) the prioritization of voice packets with data traffic. See "Set service parameters" on page 69.

5 Provide the necessary IP network infrastructure:

- 10baseT or 100baseTX Ethernet connection.
- IP address. Each ITG Line 2.1 card requires 10baseT E-LAN or 10/100baseT T-LAN unicast IP address.
- One additional IP address per node. The node IP address is the T-LAN for a subnet.

End of Procedure

After completing the network assessments, the technician can design and implement the ITG network. This can involve modifications to both the ITG elements and to the existing network. Post-installation network measurements (page 85) must be made on a regular basis to make sure QOS standards are maintained. Figure 6 shows an example of the T-LAN and E-LAN topology.

Calculate ITG traffic requirements

The technician must forecast the CCS traffic that the Meridian/Succession CSE 1000 will process via the ITG network. CCS traffic generated by an i2004 Internet Telephone is typically similar to that of a digital telephone. The following procedures calculate the bandwidth required to support given amounts of traffic.

The procedures require the following data:

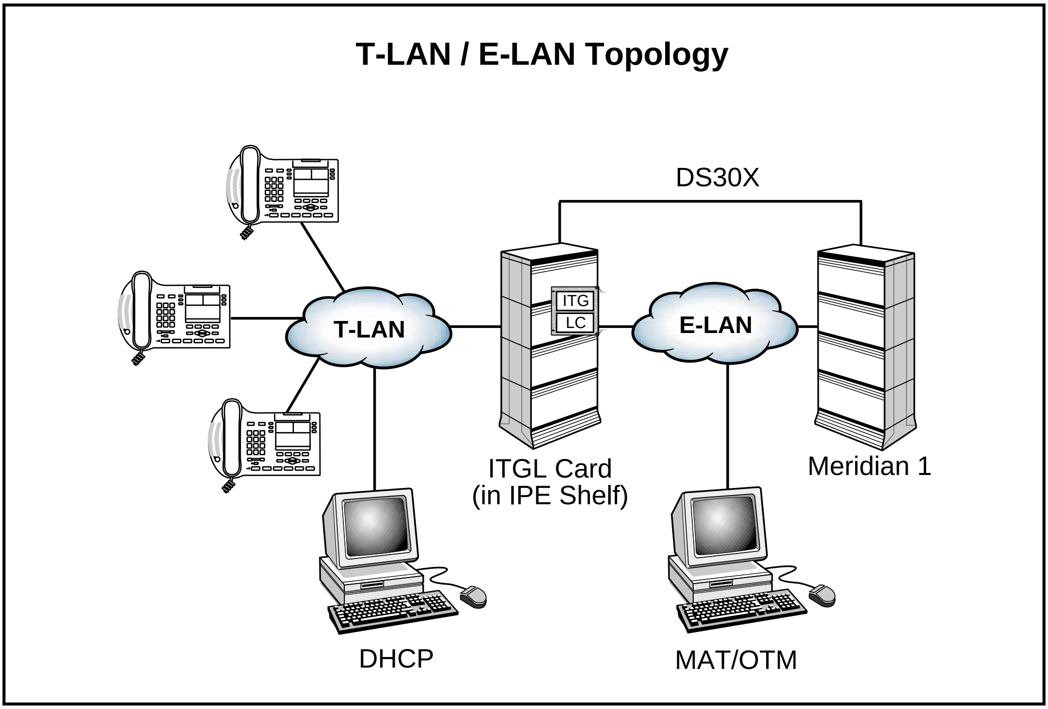
- CCS/i2004 Internet Telephone
- Number of i2004 Internet Telephones
- Number of subnets/servers accessed by i2004 Internet Telephones

Note: Base all traffic data on busy hour requirements.

The result of the calculation will provide estimated values for the following:

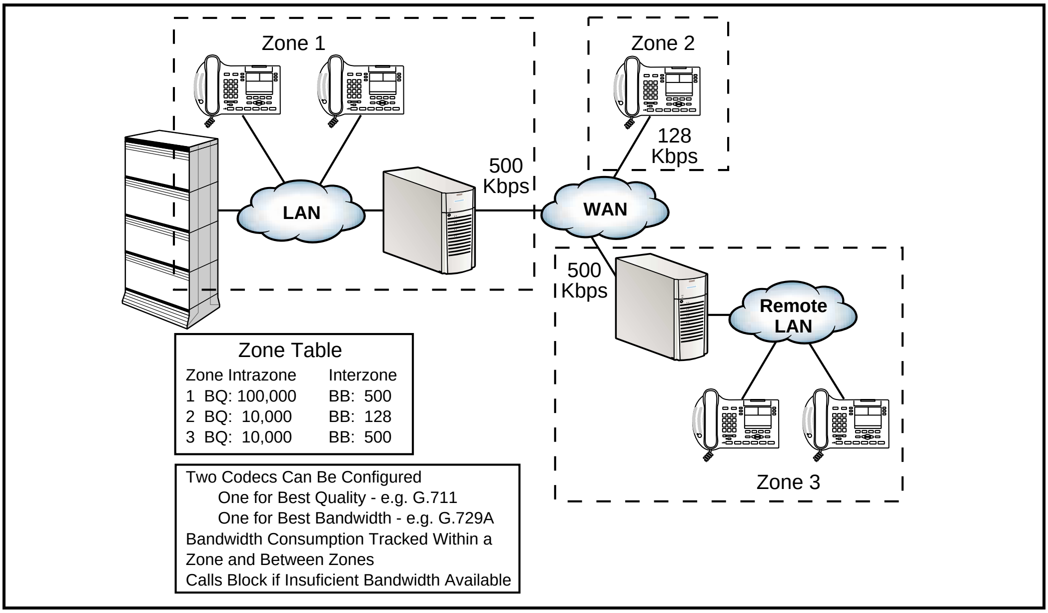
- Total T-LAN bandwidth requirement
- WAN bandwidth requirement per subnet or server/router

Figure 6
T-LAN and E-LAN Topology



For a more thorough assessment, the technician must consider the impact of incremental ITG Line 2.1 traffic on routers and LAN resources in the intranet. LAN segments can become saturated, and routers can experience high CPU utilization. A customer should consider re-routing scenarios in a case where a link is down. Figure 7 shows an example of bandwidth management.

Figure 7
Bandwidth management example



T-LAN traffic calculations

To calculate the total T-LAN requirement, add together all sources of traffic destined for the IP telephony network using the same LAN. The data rate for a T-LAN is the total bit rate.

Procedure 2
T-LAN traffic calculation procedure

1 Total subnet traffic = Number of i2004 Internet Telephones × CCS/i2004 Internet Telephone.

2 Convert to erlangs: total CCS / 36.

3 Find T-LAN bandwidth usage (kbit/s) from Table 8.

Note: Table 8 lists the Ethernet and WAN bandwidth usage of IP Line ports with the 729AB codec only.

4 Bandwidth per subnet = total erlangs × T-LAN bandwidth usage.

5 Repeat the procedure for each subnet.

6 Sum up total T-LAN bandwidth usage.

7 ITG cards = total i2004 Internet Telephones / 24.

——————— ***End of Procedure*** ———————

Table 8
T-LAN and WAN IP bandwidth usage per ITG Line 2.1 card port (silence suppression enabled)

Codec type	Packet duration (ms)	Voice payload (bytes)	VAD	Peak Bandwidth (kbits/sec)	Average bandwidth (kbits/sec)
G.711 (64 kbit/s)	20	160	Off	90400	90400
	30	240	Off	81600	81600
	20	160	On	90400	54240
	30	240	On	81600	48960
G.729A (8 kbit/s)	20	20	Off	34400	34400
	30	30	Off	25600	25600
	40	40	Off	21200	21200
	50	50	Off	18560	18560
G.729B (8 kbit/s)	20	20	On	34400	20640
	30	30	On	25600	15360
	40	40	On	21200	12720
	50	50	On	18560	11136

Note 1: The bandwidth estimates assume a full duplex connection.

Note 2: For half duplex connections, such as half duplex ethernet, the bandwidth estimates must be doubled.

Note 3: The overhead is assumed to be for ethernet connections and is comprised of: 8 bytes of Ethernet Preamble, 14 bytes of Ethernet header, 20 bytes of IP, 8 bytes of UDP, 12 bytes of RTP Header, 4 bytes of Ethernet check sum. Total Payload Encapsulation of 66 bytes.

Note 4: Different transport types will have slightly different bandwidth requirements.

Note 5: The average bandwidth is reduced from the peak bandwidth by the use of silence suppression (VAD).

Note 6: The reduction due to VAD is assumed to be 40%.

T-LAN engineering example

1 Subnet A: 36 i2004 Internet Telephones, average 6 CCS/i2004 Internet Telephone.

2 Subnet A total erlangs =36 ¥ 6/36 = 6

3 For G. 729 Annex AB with silence suppression, T-LAN bandwidth usage is 25.6 kbit/s.

4 Subnet A bandwidth = 6 ¥ 25.6 = 153.6

5 Subnet B: 72 i2004 Internet Telephones, average 5 CCS/i2004 Internet Telephone.

Subnet B total erlangs = 72 ¥ 5/36 = 10

Subnet B bandwidth = 10 ¥ 25.6 = 256

Subnet C: 12 i2004 Internet Telephones, average 6 CCS/i2004 Internet Telephone.

Subnet C total erlangs = 12 ¥ 6/36 = 2

Subnet C bandwidth = 2 ¥ 25.6 = 51.2

6 T-LAN Bandwidth = 153.6 + 256 + 51.2 = 460.8 kbps

7 Number of ITG Line 2.1 cards=(36+72+12) / 24 = 5

——— ***End of Example*** ———

Assess WAN link resources

If ITG traffic is routed over an intranet, the technician must assess the status of the network. WAN links are often the source of network capacity problems. For a locally connected i2004 telephone, if calls are routed to the PSTN, the calls will impact the capacity of the T-LAN only.

When calls are routed through an intranet, WAN links are frequently the source of capacity problems in the network. Unlike LAN bandwidth, which is virtually free and easily implemented, WAN links typically take time to obtain financial approval, provision, and upgrade. For these reasons, it is important to assess the state of WAN links in the intranet prior to implementing the ITG network.

WAN traffic calculations

For data rate requirements for the intranet route, calculation is based on duplex channels. The date rate for a WAN is the duplex data rate. For example, 120 Kbps on the LAN is equal to a 64 Kbps duplex channel on the WAN.

Procedure 1
WAN traffic calculation procedure

1 Total subnet traffic = number of i2004 Internet Telephones × CCS/i2004 Internet Telephone.

2 Convert to erlangs: total CCS / 36.

3 Find WAN bandwidth usage (kbit/s) from Table 8.

Note: Table 8 on page 61 lists the Ethernet and WAN bandwidth usage of IP Line ports with the 729AB codec only.

4 Bandwidth per subnet = total erlangs × WAN bandwidth usage.

5 Multiply bandwidth per subnet × 1.3 to adjust for traffic peaking.

6 Repeat the procedure for each subnet.

7 Adjust WAN bandwidth to account for WAN overhead depending on WAN technology used:

- ATM (AAL1): multiply subnet bandwidth × 1.20 (9 bytes overhead/44 bytes payload)
- ATM (AAL5): multiply subnet bandwidth × 1.13 (6 bytes overhead/47 bytes payload)
- Frame Relay: multiply subnet bandwidth × 1.20 (6 bytes overhead/30 bytes payload -- variable payload up to 4096 bytes)

Note: Each WAN link should be engineered to be no more than 80% of its total bandwidth if the bandwidth is 1536 kbps or higher (T1 rate); if the rate is lower, up to 50% loading on the WAN is recommended.

End of Procedure

WAN engineering example

1 Subnet A: 36 i2004 Internet Telephones, average 6 CCS/i2004 Internet Telephone.

2 Total erlangs = 36 ¥ 6/36 = 6

3 For G. 729 Annex AB with silence suppression, WAN bandwidth usage is 9.3 kbit/s.

4 Subnet A WAN bandwidth = 9.3 ¥ 6 = 55.8 kbps

5 Subnet A WAN bandwidth with 30% peaking = 55.8 ¥ 1.3 = 72.54 kbit/s.

6 Subnet B: 72 i2004 Internet Telephones, average 5 CCS/i2004 Internet Telephone.

- Total erlangs = 72 ¥ 5/36 = 10
- Subnet B WAN bandwidth = 9.3 ¥ 10 = 93 kbps
- Subnet B WAN bandwidth with 30% peaking = 93 ¥ 1.3 = 120.9 kbit/s.
- Subnet C: 12 i2004 Internet Telephones, average 6 CCS/i2004 Internet Telephone.
- Total erlangs = 12 ¥ 6/36 = 2
- Subnet C WAN bandwidth = 9.3 ¥ 2 = 18.6 kbps
- Subnet C WAN bandwidth with 30% peaking =18.6 ¥ 1.3 = 24.18 kbit/s.

7 If the WAN is known to be an ATM network (AAL1), the estimated bandwidth requirements are:

- Subnet A WAN bandwidth with ATM overhead =72.54 × 1.2 = 87.0 kbps.
- Subnet B WAN bandwidth with ATM overhead = 120.9 × 1.2 = 145.1 kbps.
- Subnet C WAN bandwidth with ATM overhead = 24.18 × 1.2 = 29.0 kbps.

End of Example

IP Voice zones

Each i2004 Internet Telephone and ITG port is assigned a zone number in which they reside. The zone indicates the bandwidth management zone of the IP devices so that IP bandwidth within locations, and between locations, can be managed. This allows users to avoid quality degradation due to insufficient bandwidth for active connections.

For example, a branch office or telecommuter location can have more i2004 Internet Telephones than are supported by the IP link to that location (for example, 128 Kbps bandwidth with 10 i2004 Internet Telephones).

The zones are also used to determine whether voice compression and silence detection is used for a connection.

Zone properties are defined in Overlay 117. Up to 256 zones can be configured. The Meridian/Succession CSE 1000 uses the zones for bandwidth management. Each zone has four parameters. The prompt lists the parameters as p1, p2, p3 and p4:

- p1 - Total bandwidth available for intrazone calls
- p2 - The preferred strategy for the choice of codec for intrazone calls (that is, preserve best quality or best bandwidth)
- p3 - The total bandwidth available for interzone calls
- p4 - The preferred strategy for the choice of the codec for interzone calls

If no IP voice zones are configured, zone 0 operates as a default zone with no restrictions on bandwidth usage. However, if any additional zones are configured, zone 0 must be configured first if it is referenced by any i2004 Internet Telephones or ITG Line 2.1 TNs.

IMPORTANT

When moving an i2004 Internet telephone, the Meridian/Succession CSE 1000 Administrator must change the zone assignment in Overlay 11. See *“X11 Input/output Guide”*, NTP 553-3001-511.

Relationship between zones and domains

Link utilization assessment

Procedure 2
Link utilization assessment procedure

1 Obtain a current topology map and link utilization report of the intranet.

2 Visually inspect the topology map to reveal which WAN links are likely to be used to deliver ITG traffic. Alternately use the traceroute tool (see “Measuring tools:” on page 71).

3 Find out the current utilization of the WAN links. For example, the link utilization may be averaged over a week, a day, or an hour.

4 Obtain the busy period (peak hour) utilization of the link.

5 Also, because WAN links are full-duplex and data services exhibit asymmetric traffic behavior, obtain the utilization of the link representing traffic flowing in the heavier direction.

6 Assess how much spare capacity is available.

Enterprise intranets are subject to capacity planning policies that ensure that capacity usage remains below some determined utilization level.

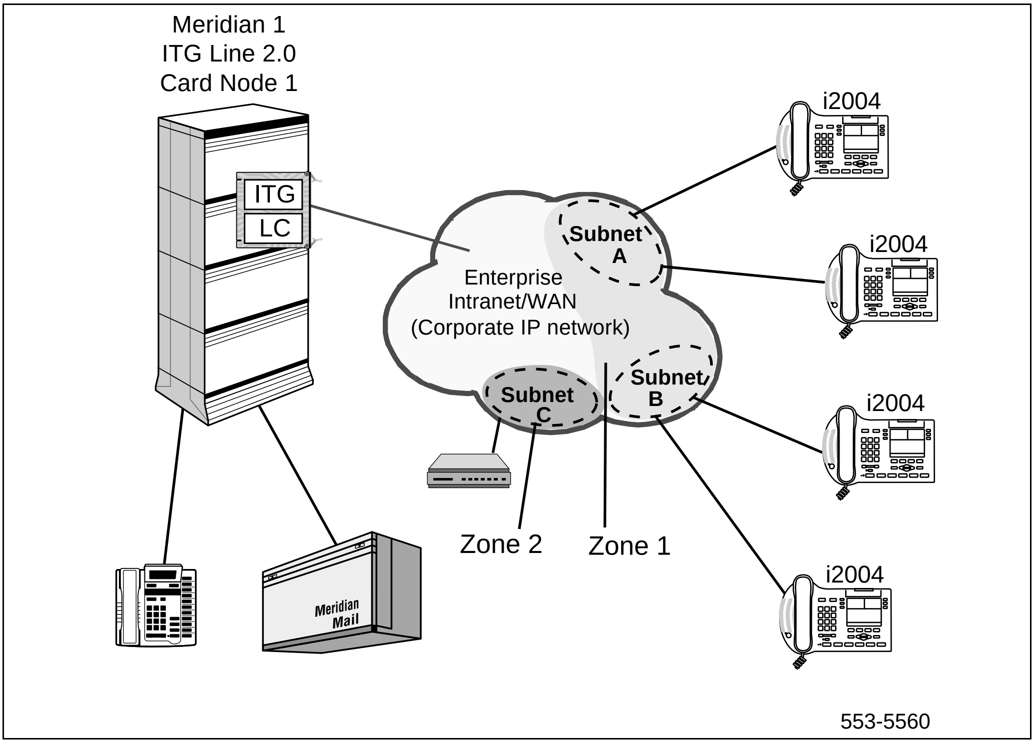
For example, a planning policy might state that the utilization of a 56 kbps link during the peak hour must not exceed 50%; for a T1 link, the threshold is higher, perhaps 80%. The carrying capacity of the 56 kbps link would be 28 kbps, and for the T1 1.2288 Mbps. In some organizations the thresholds may be lower than that used in this example; in the event of link failures, there needs to be spare capacity for traffic to be re-routed.

7 The difference between the current capacity, and its allowable limit, is the available capacity.

For example, a T1 link utilized at 48% during the peak hour, with a planning limit of 80% would have an available capacity of about 492 kbps.

End of Procedure

Figure 9
An ITG intranet with subnetworks



Estimating network loading due to ITG traffic

At this point, the technician has enough information to “load” the ITG traffic on the intranet. The following example illustrates how this is done on an individual link.

Example:

Suppose the intranet has a topology as shown in Figure 9 on page 67, and the technician wants to predict the amount of traffic between the ITG node and corporate intranet. From the Calculate ITG traffic requirements section (on page 57) and traceroute measurements, traffic between the ITG node and subnet A, the ITG node and subnet B, and the ITG node and Router/Server C are collected.

To complete this example, the traffic flow from the ITG node to all routes needs to be summed to determine the load to the link (T-LAN).

Decision: Sufficient capacity?

A link is defined as the route between the ITG Line 2.1 card node and a subnet. Table 10 organizes the computations so that for each link, the available link capacity can be compared against the additional ITG Line 2.1 card load. For example, on the link from the ITG Line 2.1 card Node to Subnet C, there is plenty of available capacity (568 kbps) to accommodate the additional 24 kbps of ITG Line 2.1 card traffic.

Table 10
Link Utilization Summary Example

Link		Utilization (%)		Available capacity (kbps)	Incremental ITG load Traffic (kbps)	Sufficient capacity?
End-points	Capacity (kbps)	Threshold	Used			
ITG_Node1 - SubnetA	1536	80	75	76.8	72.5	Yes
ITG_Node1 - SubnetB	1536	80	50	460.8	120.9	Yes
ITG_Node1 - SubnetC	1536	80	48	492	24.2	Yes
....	....	....	....	....	....	....

Some network management systems have network planning modules that compute network flows in the manner just described. These modules provide more detailed and accurate analysis as they can take into account actual node, link, and routing information. They also help the technician assess network resilience by conducting link and node failure analysis. By simulating failures, re-loading network and re-computed routes, the modules indicate where the network could run out of capacity during failures.

Insufficient link capacity

If there is insufficient link capacity, consider upgrading the link's bandwidth.

Set service parameters

Quality of Service (QOS) mechanism

QOS is controlled by setting the DiffServ Code Point (DSCP) field in the IP header for both the ITG Line 2.1 card and the i2004 Internet Telephone. Individual values are configurable for the voice and control DSCP values and can be configured to a number between 0 and 63 inclusive using the following (and above) versions:

- OTM 1.0.15
- MAT 6.67.07
- MAT 6.6 with the latest update disk from the ESD site

The values are set once for each system and apply to all packets sent by the ITG Line 2.1 card and the i2004.

With the versions listed above, the default value is 0. If DiffServ is implemented on the network, the IP Network Administrator should change the default value of 0 to another value. The recommended configuration values are:

- voice DSCP: 46 - Expedited Forwarding (EF)
- control DSCP: 40 - Class Selector 5 (CS5)

Note: OTM 1.1 has 46 and 40 as the default values.

In some cases the IP Network Administrator can set the DiffServ field at the edge of the QOS-controlled network by routers at the network edge. DiffServ can be set based on source or destination address, or port number. The ITG Line 2.1 card and i2004 Internet Telephone can be configured to have RPT voice UDP port numbers in a specific range.

ITG Line 2.1 card and i2001 Internet Telephone port numbers

The following are RPT voice UDP port numbers that can be configured for the ITG Line 2.1 card and i2004 Internet Telephone.

TFTP UDP port 69:	used for firmware download to i2004
UniStim/RUDP UDP port 4100:	in to the ITG Line 2.1 card (registration)
Unistim/RUDP UDP port 5000:	out to etherset (signaling)
UniStim/RUDP UDP port 5100:	in to the ITG Line 2.1 card (signaling)
UniStim/RUDP UDP port 7300:	in to the ITG Line 2.1 card (registration)
RTP UDP ports 5200-5246:	in to the ITG Line 2.1 card (programmable; 5200 + TCID*2)
RTP UDP port 5200:	out to the etherset
RTCP UDP port 5201-5247:	in to the ITG Line 2.1 card (RTP port + 1, thus indirectly progammable)
RTCP UDP port 5201:	out to the etherset

Measure intranet Quality of Service

Utilization of the existing data network must be assessed to determine the quality of voice services it can support.

End-to-end delay and error characteristics of the intranet must be measured so that the technician can set realistic QOS expectations for intranet voice services.

IMPORTANT

Network designers must be aware of traffic calling patterns between any combination of i2004 Internet Telephones and gateway channels, and must plan the capacity of connecting elements to handle the expected traffic.

The use of measuring tools requires a starting node and a destination node. The starting node can be a “PING” (see page 71) host on a LAN segment attached to the router intended to support the ITG Line 2.1 card node. The destination node can be a remote subnet. The requirement is briefly described as follows.

> ***Note:*** Make sure that the ITG network TOS/DiffServe bytes are set to their intended operational values before taking measurements.

Criteria

- **End-to-end packet delay:** Packet delay is the point to point one-way delay between the time a packet is sent to the time it is received at the remote end. It is comprised of delays at the ITG Line 2.1 card, i2004 Internet Telephone and the IP network. To minimize delays, the ITG node and i2004 Internet Telephone must be located to minimize the number of hops to the network backbone, or WAN.

  Note: To assure a good voice quality, the end-to-end delay, in the IP network, is recommended to be <= 50 ms.

- **End-to-end packet loss:** Packet loss is the percentage of packets sent that do not arrive at their destination. Transmission equipment problems, packet delay, and network congestion cause packet loss. In voice conversation, packet loss appears as gaps in the conversation. Sporadic loss of a few packets can be more tolerable than infrequent loss of a large number of packets clustered together.

  Note: For high quality voice transmission, the long-term average packet loss must be < 1%, and the short-term packet loss must not exceed 5% in any 10 second interval.

Measuring tools:

- PING (Packet Internet Groper)
- Traceroute

Both PING and traceroute are basic measuring tools that can be used to assess the ITG network. They are standard utilities that come with most commercial operating systems. PING is used to measure the round-trip delay of a packet and the percentage of packet loss; while traceroute breaks down delay segments of a source-destination pair and any hops in-between.

There are several third party applications that perform data collection similar to the way PING and traceroute do. In addition, these programs also analyze data and plot performance charts. Using PING/traceroute to collect data for manual analysis is more labor intensive, however, the information provided by these basic tools is just as useful as the more sophisticated applications.

The following analysis will use PING/traceroute data for discussion, although it is likely in most situations a third party application will be used.

Destination Types

To a Remote Subnet

This configuration involves an intranet subnet that is attached to a number of i2004 Internet Telephones, which serves as a hub for delivering voice packets between the i2004 Internet Telephone and the ITG network. Collect the delay measurement between the PING host and the subnet server.

Measuring end-to-end network delay

The basic tool used in ITG networks to measure end-to-end network delay is the PING program. PING takes a delay sample by sending an ICMP packet from the host of the PING program to a destination server, and waits for the packet to make a round trip.

To ensure the delay sample results are representative of the ITG_node1:

- **a.** attach the PING host to a “healthy” LAN segment.
- **b.** attach the LAN segment to the router intended to support the ITG Line 2.1 card node.
- **c.** choose a destination host by following the same critical guidelines as for the source host.

The size of the PING packets can be any number; the default is 60 bytes.

Sample PING output:

ITG_Node1% PING -s subnetA 60

PING subnetA (10.3.2.7): 60 data bytes

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=97ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=100ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=102ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=97ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=95ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=94ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=112ms

68 bytes from (10.3.2.7): icmp_seq=0 ttl=225 time=97ms

^?

--- ITG_Node1 PING Statistics ---

8 packets transmitted, 8 packets received, 0% packet loss

round-trip (ms) min/avg/max = 94/96/112

End of Output

Assessment of sample PING output

> ***Note:*** The round-trip time (*rtt*) is indicated by the time field.

Notice the variation of *rtt* from the PING output. It is from repeated sampling of *rtt* that a delay characteristic of the intranet can be obtained. In order to obtain a delay distribution, the PING tool can be embedded in a script which controls the frequency of the PING probes, timestamps and stores the samples in a raw data file. The file can then be analyzed later using a spreadsheet or another application. The technician can also check whether the intranet's network management software has any delay measurement modules which can obtain a delay distribution for a specific route.

Delay characteristics vary depending on the site pair and the time-of-day. The “site pair” is defined as the measurement between the host ITG and the remote subnet (for example, ITG to subnet A in Figure 9 on page 67). The assessment of the intranet must include taking delay measurements for each ITG site pair. If there is significant variation of traffic in the intranet, it is best to include PING samples during the intranet's peak hour. For a more complete assessment of the intranet's delay characteristics, obtain PING measurements over a period of at least a week.

Measuring end-to-end packet loss

The PING program also reports whether the ICMP packet made its round trip successfully or not. Use the same PING host setup to measure end-to-end error, and, in making delay measurement, use the same packet size parameter.

Sampling error rate, however, requires taking multiple PING samples (at least 300 to be statistically significant), thus obtaining an error distribution requires running PING over a greater period of time. The error rate statistic collected by multiple PING samples is called packet loss rate (PLR).

Recording routes

Routing information for all source-destination pairs need to be recorded as part of the network assessment. This is done using the traceroute tool; an example of the output is shown below.

itg_node1% traceroute subnetA

traceroute to subnetA 10.3.2.7, 30 hops max, 32 byte packets

1 r6 (10.8.0.1) 1 ms 1 ms 1 ms

2 r5 (10.18.0.2) 42 ms 44 ms 38 ms

3 r4 (10.28.0.3) 78 ms 70 ms 81 ms

4 r1 (10.3.0.1) 92 ms 90 ms 101 ms

5 subnetA (10.3.2.7) 94 ms 97 ms 95 ms

The traceroute program can also be used to verify whether routing in the intranet is symmetric or not for each of the source-destination pairs. This can be done using the `-g` loose source routing option, as illustrated in the following command syntax:

itg_node1% traceroute -g subnetA itg_node1

Adjusting PING measurements

One-way vs. roundtrip

The PING statistics are based on round-trip measurements, whereas the QOS metrics in the Transmission Rating model are one-way. Halve the delay and packet error PING statistics, to ensure the comparison is valid.

Adjustment due to ITG processing

The PING measurements are taken from PING host to PING host. The Transmission Rating QOS metrics are from end user to end user, and thus include components outside the intranet. The PING statistic for delay needs to be further modified by adding 93ms to account for the processing and jitter buffer delay of the ITG Line 2.1 card nodes.

Note: No adjustment needs to be made for error rates.

If the intranet measurement barely meets the round-trip QOS objectives, the technician needs to be aware that there is a possibility that the one-way QOS is not met in one of the directions of flow. This can be true even if the flow is on a symmetric route due to asymmetric behavior of data processing services.

The high priority and low priority input buffers (HPIB) and low-priority input buffers (HPIB and LPIB) need to be set to a value of 32 or greater.

Late packets

Packets that arrived outside of the window allowed by the jitter buffer are discarded by the ITG. To determine which PING samples to ignore, first calculate the average *one-way delay* based on all the samples.

To calculate late packets, double the value of the nominal jitter buffer setting. For example, assume:

- The average one-way delay is 50 msec
- The jitter buffer is set to a nominal (or average) value of 40 msec
- Then the maximum value is 2 x 40 + 50 = 130 msec.

Therefore, any packet with a one-way delay of greater than 130 msec is late, and must be added to the total number of packets lost.

A “site pair” is defined as the measurement between the host ITG and the remote subnet served by a server (for example, ITG to subnet A in Figure 9 on page 67).

Estimate Voice Quality

The perceived quality of a telephone call is dependent on many factors, such as codec characteristics, end-to-end delay, packet loss and the perception of the individual listener.

The E-Model Transmission Planning Tool is a model used to produce a quantifiable measure of voice quality based on relevant factors. Refer to two ITU-T recommendations, ITU-T E.107 and E.108 for more information on the E-Model and its application.

A simplified version of the E-Model is applied to the i2004 Internet Telephone to provide an estimate of the voice quality the user can expect based on various configuration choices and network performance metrics.

The simplified E-Model is given below:

R = 94 - lc - ld - lp

where: lc = codec impairment (see Table 11)

ld = delay impairment (see Table 12)

lp = packet loss impairment (see Table 13)

Note: This model already takes into account some characteristics of the i2004 Internet Telephone, and therefore the impairment factors are not identical to those shown in the ITU-T standards.

Refer to Table 14 on page 79 for translation of R values into user satisfaction levels.

Table 11
Impairment factors of codecs

Codec	Impairment (msec frames)
G.711	0
G.729A/AB	11 - 20 or 30
G.729A/AB	16 - 40 or 50

Table 12
Impairment factors due to network delay

Network delay* (msecs)	Impairment
0 -49	0
50 - 99	5
100 -149	10
150 - 199	15
200 - 249	20
250 - 299	25
* Network delay is the average one-way network delay plus jitter	

Table 13
Impairment factors due to packet loss

Packet loss (%)	Impairment
0	0
1	4
2	8
4	15
8	25

Table 14
R Value translation table

R Value (lower limit)	MOS	User Satisfaction
90	4.5	Very satisfied
80	4.0	Satisfied
70	3.5	Some users dissatisfied
60	3.0	Many users dissatisfied
50	2.5	Nearly all users dissatisfied
0	1	Not recommended

Sample scenarios:

1 A local LAN has the following characteristics: G.711 codec, 20 msec network delay, 0.5% packet loss

R = 94 - lc - ld - lp

from Tables 13, 14 and 15, lc = 0, ld = 0, lp = 2

then, R = 94 - 0 - 0 - 2

R = 92

from Table 17, users are very satisfied.

2 A campus network has the following characteristics: G.711 codec, 50 msecs delay, 1.0% packet loss

R = 94 - lc - ld - lp

from Tables 13, 14 and 15, lc = 0, ld = 5, lp = 4

then, R = 94 - 0 - 5 - 4

R = 85

from Table 17, users are satisfied.

3 A WAN has the following characteristics: G.729 codec, 30 msec network delay, 2% packet loss.

R = 94 - lc - ld - lp

from Tables 13, 14 and 15, lc = 11, ld = 5, lp = 8

then, R = 94 - 11 - 5 - 8

R = 70

from Table 17, some users are dissatisfied.

DiffServ/TOS

The Type of Service (TOS) byte or Differentiated Service (DiffServ) code point determines the priorities of the management and voice packets in the ITG network. The range for both management and voice packet DiffServ/TOS is 0-63 inclusive.

You can configure the DiffServ/TOS value, if required, to obtain better QOS over the IP data network (LAN/WAN).

The value entered depends on the policy in the customer’s data network.

> ***Note:*** The default value for both is 0. Do not change DiffServ/TOS from default value of 0 unless instructed by the ITG network administrator.

Loss and Level Plan

The ITG Line 2.1 card ships with a predefined loss and level plan. The loss and level plan determines various parameters, such as transmission gain, that vary from country to country. The values are stored in a file on the MAT 6.6/OTM 1.0 PC. The default loss and level plan is for the United States. You can select other countries when you configure the DSP Profile settings in the MAT 6.6/OTM 1.0 ITG IP Phones application.

Echo canceller

ITG Line 2.0 supports echo canceller tail lengths of 8,16 and 32 msec. The default in MAT and OTM is the maximum of 32 msec. It is recommended to always use the maximum echo canceller tail length.

The ITG Line 2.1 application software contains an enhanced echo canceller. The new echo canceller has improved echo cancellation algorithms and supports tail lengths up to 128 msec. The OTM 1.0.15, MAT 6.67.07 and MAT 6.6 versions do not offer the enhanced tail length values in their echo canceller tail pull down menu. Because the ITG Line 2.1 software can be used with any version of the MAT/OTM product, it scales the configured tail length, if necessary, so that the maximum tail length is achieved. The scaling provides the following echo cancelling tail lengths:

8 -> 32 msec
16 -> 64 msec
32 -> 128 msec

As before, the maximum tail length is the recommended value. Selecting the MAT/OTM default of 32 msec yields the desired maximum tail length of 128 msec.

An update to OTM 1.1 changes the echo canceller tail configuration pull down list to the values 64 and 128. When used with the ITG Line 2.1 application software, the application no longer needs to scale the configured value. The configured value matches the actual tail length used by the echo canceller.

> ***Note:*** If the new OTM version is used with an ITG Line 2.0 software version, such as ITGL2.01.53, selecting 64 or 128 sets the echo tail length to 32 msec.

Reducing delays

The link delay is the time it takes for a voice packet to be queued on the transmission buffer of a link until it is received at the next hop router. Link delay can be reduced by:

- upgrading link capacity. This reduces the serialization delay of the packet, but also reduces the utilization of the link and the queueing delay. Before upgrading a link the technician must check both routers connected to the link to be upgraded and make sure that router configuration guidelines are complied with.
- implementing a priority queueing discipline.

To determine which links should be considered for upgrading, first list all the intranet links used to support the ITG traffic, which can be derived from the traceroute output for each site pair. Then, using the intranet link utilization report, note the highest utilized and/or the slowest links. Estimate the link delay of suspect links using the traceroute results.

Example: a 256kbps link from router1 to router 2 has a high utilization. The following is a traceroute output that traverses this link:

```
ITG_Node1% traceroute SubnetA
traceroute to SubnetA (10.3.2.7), 30 hops max, 32 byte packets
    router1 (10.8.0.1) 1 ms 1 ms  1 ms
    router2 (10.18.0.2) 42 ms  44 ms  38 ms
    router3 (10.28.0.3) 78 ms  70 ms  81 ms
    router4 (10.3.0.1) 92 ms  90 ms  101 ms
    SubnetA (10.3.2.7) 94 ms  97 ms  95 ms
```

The average rtt time on the example link is about 40 ms; the one-way link delay is about 20 ms, of which the circuit transmission and serialization delay are just a few milliseconds. Most of this link's delay is due to queueing.

Reducing hop count

The ITG Line 2.1 card nodes must be connected to the intranet to minimize the number of router hops between the ITG Line 2.1 card and the i2004 Internet Telephone. This will reduce the fixed and variable IP packet delay, and improve the Voice over IP Quality of Service. It is recommended that no more than one card utilize a particular 10BaseT LAN collision domain.

> ***Note:*** In a passive Ethernet hub, all ports on the hub share one 10Mbps collision domain; in a switched Ethernet hub, each port has its own collision domain.

The ITG Line 2.1 card node and the T-LAN router should be placed as close to the WAN backbone as possible in order to:

- minimize the number of router hops.
- segregate constant bit-rate Vo IP traffic from bursty LAN traffic.
- simplify the end-to-end QOS engineering for packet delay, jitter, and packet loss.

If an access router separates the ITG Line 2.1 card node from the WAN router, there must be a high-speed link (for example, Fast Ethernet, FDDI, SONET, OC-3c, ATM STS-3c) between the access router and the WAN backbone router.

Reducing packet errors

Packet errors in intranets are generally correlated with congestion somewhere in the network. Bottleneck links tend to be where the packet errors are high because packets get dropped when they arrive faster than the link can transmit them. The task of upgrading highly utilized links should also remove the source of packet errors on a particular flow. Also an effort to reduce hop count gives fewer opportunities for routers and links to drop packets.

Other causes of packet errors, not related to queueing delay, are as follows:

- **Poor link quality.** The underlying circuit may have transmission problems, high line error rates, subject to frequent outages, etc. Note that the circuit may be provisioned on top of other services, such as X.25, frame relay, or ATM. Check with the service provider for resolution.

- **Overloaded CPU**. This is another commonly-monitored statistic collected by network management systems. If a router is overloaded, it means that the router is constantly performing processing-intensive tasks, which impedes the router from forwarding packets. Find out what the threshold CPU utilization level is, and check if any suspect router conforms to the threshold. The router may have to be re-configured or upgraded.
- **Saturation.** Routers can also be overworked when there are too many high capacity and high traffic links configured on it. Ensure that routers are dimensioned according to vendor guidelines.
- **LAN saturation.** Packets may be dropped on under-engineered or faulty LAN segments.
- **Jitter buffer too small.** Packets that arrive at the destination ITG, but too late to be placed in the jitter buffer are essentially loss packets.

Adjusting jitter buffer size

The jitter buffer parameters directly affect the end-to-end delay. Lowering the *voice playout* settings decreases *one-way delay*, but this comes at the expense of giving less waiting time for voice packets that arrive late.

You adjust the jitter buffer size when you configure the DSP Profiles in the ITG IP Phone application. The jitter buffer is statically configured and is the same for all devices in the network. The jitter butter size range is 0-200 milliseconds. The default value is 50 milliseconds.

As each call is set up, the jitter buffer for each device is set to the next larger configurable value for the selected codec. If the jitter buffer depth is configured as zero, the depth of the jitter buffer is set to the smallest value the device can support. In practice, the optimum depth of the jitter queue is different for each call. For sets that are on a local LAN connection, a short jitter queue is desirable to minimize delay. For sets that are several router hops away, a longer jitter queue is required.

Lowering the jitter buffer size decreases the *one-way delay* of voice packets; however setting the jitter buffer size too small will cause unnecessary packet discard.

If the technician decides to discard packets, to downsize the jitter buffer, he must do the following:

- **Check the delay variation statistics.** Obtain the *one-way delay* distributions originating from all source ITG sites.
- **Compute the standard deviation of *one-way delay* for every flow.** Some traffic sources with few hop counts yield small delay variations, but it is the flows that produce great delay variations that should be used to determine whether it is acceptable to resize the jitter buffer.
- **Compute the standard deviation (σ) of one-way delay for that flow.** It is recommended that the jitter buffer size should not be set smaller than 2σ.

Codec selection

There is a potential to degrade the voice quality if codecs are cascaded. This can occur when there are multiple compression and decompression stages on a voice call. The more IP links utilized in a call, the more delay is added, and therefore the greater the impact on the voice quality. The following lists a few applications and devices which can impact voice quality:

- Voice Mail, for example, Call Pilot, introduces another stage of compression and decompression
- Conferences can double the number of IP links
- ITG Trunks can add additional stages of compression and decompression

To ensure optimal voice quality, it is recommended to minimize the number of compression and decompression stages and wherever bandwidth permits, use G.711 codec.

Post-installation network measurements

The design process is continual, even after implementation of the ITG network and commissioning of voice services over the network. Network changes – in actual ITG traffic, general intranet traffic patterns, network policies, network topology, user expectations and networking technology – can render a design obsolete or non-compliant with QOS objectives. The design needs to be reviewed periodically against prevailing network conditions and traffic patterns.

It is assumed that the customer's organization already has processes to monitor, analyze, and re-design both the Meridian/Succession CSE 1000 network and the corporate intranet to maintain internal QOS standards. When operating an ITG network, additional processes must be developed to:

- collect, analyze, and forecast ITG traffic patterns.
- monitor operational measurements (see below).
- implement changes in the ITG and intranet when planning thresholds are reached.

By instituting these new processes, the ITG network can be managed to ensure that desired QOS objectives are met.

ITG Operational Measurement

The ITG Line 2.1 card collects operational measurements from the i2004 Internet Telephone sets and DSP channels and saves the information to a log file every 60 minutes. The operational measurements include:

- i2004 Internet Telephone Registration Attempted/Confirmed.
- i2004 Internet Telephone Unregistration Attempted/Confirmed.
- Audio Stream Set Up Attempted/Completed.
- Total Voice Time (min.).
- i2004 Internet Telephone Phone Total Packets Lost/Late.
- DSP Channel Total Packets Lost/Late.

OM Report description

The OM log file is a comma-separated (.csv) file stored on the MAT 6.6/OTM 1.0 PC. Using MAT/OTM you can run an adhoc report or schedule a regular report. A new file is created for each month of the year in which OM data is collected. It can be read directly or imported to Microsoft Excel for post-processing and report generation. Collect these OM reports and store them for analysis. At the end of each month, identify the hours with the highest packet lost/late statistics and standard deviation statistics generated. Compare the data to target network QOS objectives.

Declines in QOS can be observed through the comparison of QOS between last period and current period. A consistent inferior measurement of QOS compared with the objective should trigger an alarm to the customer that the customer must take steps to strengthen the performance of the route.

The card creates a new log file each day. Files are automatically deleted after seven days.

ITG Line 2.1 E-LAN and T-LAN configuration

A subnet is defined as a remote network serving a collection of i2004 Internet Telephones, which is represented by a Server or Router communicating with the ITG processor for VoIP service. (See Figure 9 on page 67.)

General requirements

- no broadcast
- no bootp relay agent
- no NAT

Separate subnet configuration

Each ITG Line 2.1 card has two Ethernet ports, one for the Telephony LAN (T-LAN) and one for the Embedded LAN (E-LAN). The advantages of this configuration are:

- optimization of Vo IP performance on the Telephony LAN segment by segregating it from E-LAN traffic and connecting the T-LAN as close as possible to the WAN router.
- making the amount of traffic on the T-LAN more predictable for QOS engineering.
- optimization of E-LAN performance. For example, for Symposium Call Center Server (SCCS) and Call Pilot functional signaling, segregating the E-LAN from ITG T-LAN VoIP traffic.
- enhanced network access security by allowing the modem router to be placed on the E-LAN, which can be isolated from the customer's enterprise network (C-LAN), or have access to and from the C-LAN only through a fire-wall router.
- Meridian/Succession CSE 1000 E-LAN secure from unauthorized access

Installation and configuration summary

Contents

This section contains information on the following topics:

Overview

This chapter provides a summary of the procedures required to install a new Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 card node, add cards to the node, install the cards, transmit data to the cards, and install the i2004 Internet Telephone. It also includes information on what you need before beginning the installation procedures.

Be sure to read the Engineering guidelines section before you install an ITG Line 2.1 node.

Before you begin

1 Upgrade Meridian/Succession CSE 1000 software to Release 25.15 or later.

2 Upgrade the Meridian/Succession CSE 1000 keycode to expand the ISM system limit to support the number of i2004 Internet Telephones you plan to install. Refer to Overlay 22 in the *Meridian/Succession CSE 1000 System Maintenance Guide* (553-3001-511).

3 Verify that you have the latest Meridian Administration Tools (MAT) version 6.67.07(with disk update and loss plan patch) and Optivity Telephone Management (OTM) version 1.0 (or later).

a Check the Meridian/Succession CSE 1000 ESD website to determine the latest software version and required patches (PEPs).

Refer to Procedure 15, “Verify card software and i2004 Internet Telephone firmware” on page 153.

b Upgrade to the latest MAT/OTM version if necessary.

Refer to “ITG MAT 6.67.07 (with update disk and loss plan patch)/OTM 1.0 setup on PC” on page 159 for further details.

4 Create site name, system name and customer number in the MAT/OTM Navigator. Specify the correct Meridian/Succession CSE 1000 system type in order for MAT "**ITG IP Phone**" application to prompt for correct TN format.

5 Provision the IP network for ITG Line 2.1 card node and i2004 sets

a Choose the i2004 DHCP mode: Full, Partial or None (static IP address). For Full DHCP mode, refer to “Configuring DHCP server to support Full DHCP mode” on page 101.

b Determine the i2004 10/100BaseT Ethernet LAN connection: desktop hub or switch, or a separate cable to the equipment closet.

c Determine T-LAN, E-LAN IP address and Ethernet connections from the network IP administrator. Refer to the “IP Network engineering guidelines” on page 55.

6 Check that the required LAN and WAN networking equipment and cables are installed. For IP networking requirements, refer to “IP Network engineering guidelines” on page 55.

End of Procedure

Installation procedure summary

Summary of steps

The following summary of steps can be used as a reference guide to install and configure an ITG Line 2.1 card node. This summary is intended to serve as a pointer to the more detailed procedures contained in other chapters and to provide a sequential flow to the steps involved in the overall installation procedure.

> ***Note:*** Complete all installation and configuration steps before you transmit data to the ITG line cards.

1 Complete the ITG Line 2.1 card installation summary sheet. Refer to Table 12 on page 94.

2 Complete the i2004 Internet Telephone configuration data summary sheet. Refer to Table 13 on page 95.

3 Install the hardware components:

- **a** Install and cable ITG Line 2.1 card(s). Refer to Procedure 1 on page 113.
- **b** Install an ITG-specific I/O Panel Filter Connector (large Systems only). Refer to Procedure 2 on page 115.
- **c** Install the E-LAN, T-LAN serial interface cable. Refer to Procedure 3 on page 117.

4 Configure ITG Line 2.1 data on the Meridian/Succession CSE 1000

- **a** Configure the IP address for the Meridian/Succession CSE 1000 E-LAN Ethernet interface. Refer to Procedure 4 on page 119.
- **b** Configure bandwidth management zones. Refer to page 119.
- **c** Configure ITG physical TNs. Refer to page 121.
- **d** Configure virtual superloops. Refer to page 122.
- **e** Small system mapping of virtual superloops. Refer to page 123.
- **f** Configure i2004 Meridian/Succession CSE 1000 features. Refer to page 124

5 Configure ITG Line 2.1 data on MAT/OTM

- **a** Manually add an ITG Line 2.1 node. Refer to Procedure 5 on page 128.

- **b** Configure ITG line card properties. Refer to Procedure 6 on page 131.
- **c** Configure DSP Profile data. Refer to Procedure 7 on page 134.
- **d** Configure Meridian/Succession CSE 1000 call server E-LAN IP address and T-LAN Voice port on ITG Line 2.1 card. Refer to Procedure 8 on page 136.
- **e** Configure SNMP traps. Refer to Procedure 9 on page 138.
- **f** Configure security for SNMP access. Refer to Procedure 10 on page 140.
- **g** Configure alarm notification feature. Refer to Procedure 11 on page 141.

6 Transmit ITG line card configuration data from MAT to the ITG cards

- **a** Set Leader 0 IP Address. Refer to Procedure 12 on page 147.
- **b** Transmit node and card properties to Leader 0. Refer to Procedure 13 on page 149.
- **c** Transmit card properties to all cards in the node. Refer to Procedure 14 on page 151.

7 Upgrade card software and i2004 Internet Telephone firmware

- **a** Verify card software and i2004 set firmware release. Refer to Procedure 15 on page 153.
- **b** Determine latest software and firmware versions from Meridian/Succession CSE 1000 Electronic Software Documentation (ESD) website. Refer to Procedure 15 on page 153.
- **c** Upgrade ITG Line card software (if required). Refer to Procedure 16 on page 154.
- **d** Upgrade i2004 Internet telephone firmware (if required). Refer to Procedure 17 on page 157.

8 Assemble and install an i2004 Internet Telephone. Refer to Procedure 19, “Manual first-time installation of the i2004 Internet Telephone” on page 167; and to the *Meridian/Succession CSE 1000 Internet Telephone i2004 User Guide,* version 1.0.

End of Procedure

ITG Line 2.1 card installation summary sheet

Nortel Networks recommends that you complete an ITG Line 2.1 card installation summary sheet (Table 12) as you unpack, inventory and provision the cards. IP information will normally be supplied by the customer’s IP Network Administrator.

In order to complete the installation summary sheet you need to know:

- the MAC address. This is the MOTHERBOARD Ethernet address on the ITG Line 2.1 card faceplate sticker (for example 00:60:38:01:12:77).
- the E-LAN Management IP address of the MOTHERBOARD Ethernet interface used to perform management through MAT/OTM and to communicate with the Meridian 1 PBX.
- the T-LAN Node IP address for the ITG i2004 Line 2.0 node.
- the T-LAN card IP address of the voice interface on each card.
- the IP address of the active ELNK Ethernet interface on the Meridian/Succession CSE 1000 core.

Table 12
ITG Line 2.1 card installation summary sheet

Site________________________ Meridian/Succession CSE 1000 system________________________
Meridian/Succession CSE 1000 customer________________________
Node ID (Number)________________________
T-LAN Node IP address________________________
Meridian/Succession CSE 1000 active ELNK IP address________________________
SNMP Manager List IP addresses________________________
T-LAN subnet mask________________________
T-LAN gateway (router) IP address________________________
E-LAN subnet mask__________________________
E-LAN gateway (router) IP address________________________

TN	E-LAN Management MAC address	E-LAN Management IP address	T-LAN (Voice) Card IP address	Card role
				leader
				follower (MAT: Leader1)
				follower
				follower
				follower
				follower
				follower
				follower
				follower
				follower
				follower
				follower
				follower

i2004 Internet Telephone configuration data summary sheet

Table 13
i2004 Internet Telephone configuration data summary sheet

Manual IP configuration			Connect server IP address*	Node#	VTN	DN	User Name	User Location
IP address	subnet mask	Gateway IP address						
*Connect server IP address is the Node IP address of the ITG i2004 Line 2.0 node.								

Configuration of the DHCP server

Contents

This section contains information on the following topics:

Overview

This chapter provides general guidelines to configure a host with a Dynamic Host Configuration Protocol (DHCP) server to support the i2004 Internet Telephone.

Note 1: This chapter assumes that you are familiar with RFC 2131, RFC 1533, and the Help manual for the DHCP server on your host. A convenient source for RFCs is http://www.ietf.org/

Note 2: For a general overview of DHCP server technology, refer to Appendix F: "DHCP Supplementary Information" on page 283.

Note 3: For DHCP server setup and configuration information, refer to Appendix G: "Setup and Configuration of DHCP Servers" on page 295.

i2004 Internet Telephone

The i2004 Internet Telephone is an IP Telephone, which functions as a terminal to the Meridian/Succession Communication Server for Enterprise (CSE) 1000. It encodes voice as binary data and packetizes the data to transmit it over an IP Network to the ITG Line 2.1 card or to another i2004 Internet Telephone.

The Nortel Networks i2004 Internet Telephone can act as a DHCP client in one of two modes:

- Partial DHCP mode
- Full DHCP mode

Partial DHCP mode

When the i2004 Internet Telephone is configured to operate in partial DHCP mode, the DHCP server needs no special configuration to support i2004 Internet Telephones. What it gets from the DHCP server is the following network configuration parameters:

- IP address configuration for the i2004 Internet Telephone set
- Subnet mask for the i2004 Internet Telephone IP address
- Default gateway for the i2004 Internet Telephone LAN segment

Full DHCP mode

In full DHCP mode, the DHCP server requires special configuration. The i2004 Internet Telephone obtains network configuration parameters and also connect server configuration parameters from specially configured DHCP server.

The following configuration parameters are provided for the primary and secondary connect servers:

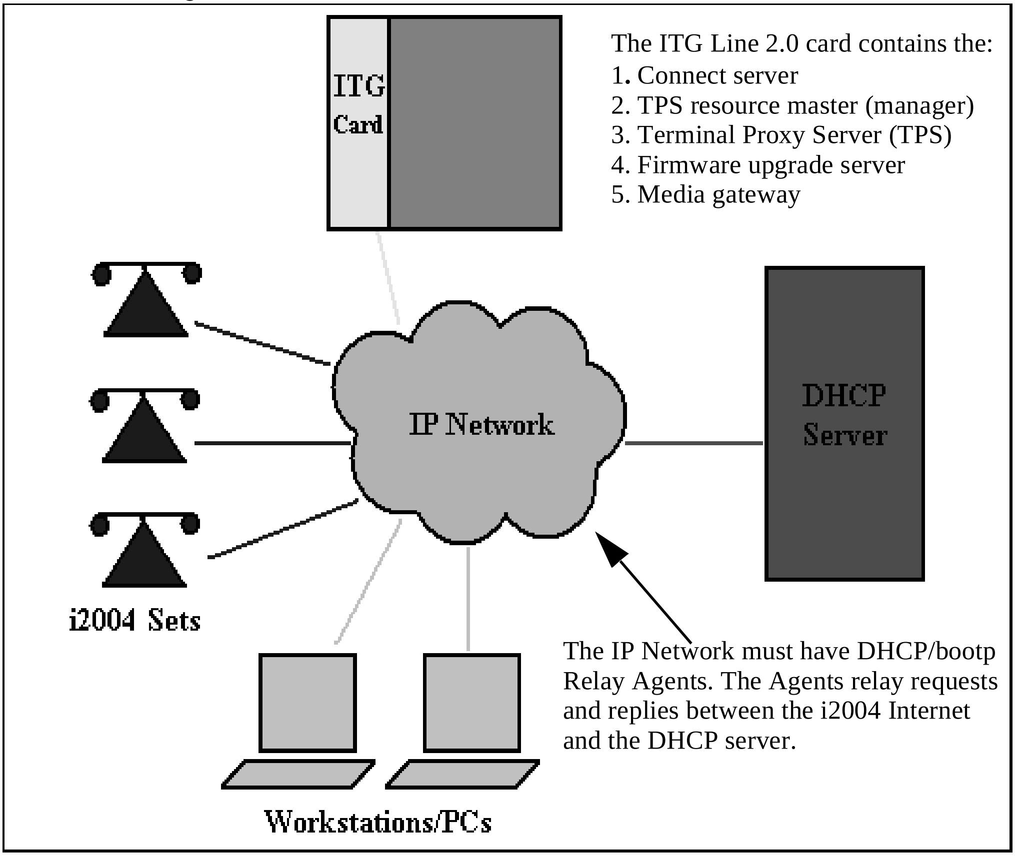
- Connect server IP address. For ITG Line 2.1, the connect server IP address is the ITG line node 2.0 IP address.
- A port number of 4100.
- A command value of one, that identifies the request to the connect server as originating from an i2004 Internet Telephone.
- A retry count typically equal to 10.

All the configuration parameters for the i2004 Internet telephones can be entered manually. However, this method is tedious since each i2004 Internet Telephone requires the network configuration parameters, connect server parameters, as well as ITG 2.0 node ID and Virtual TN. If there are many i2004 Internet Telephones to configure, manual configuration is time consuming and error prone. Using Full or Partial DHCP to configure the i2004 Internet Telephones automatically is more efficient and flexible; ensuring that current up-to-date information is used.

> ***Note 1:*** The ITG Line 2.1 node ID and virtual TN must always be configured manually even in Full DHCP mode.

> ***Note 2:*** In Partial DHCP mode the connect server parameters must be entered manually as well as the node ID and VTN.

Figure 15
DHCP block diagram



ITG Line 2.1 card

An ITG Line 2.1 card is an interface between the i2004 Internet Telephone and the Meridian 1 PBX. It provides interfaces to:

- the terminal proxy server for signalling between the i2004 and Meridian/Succession CSE 1000 virtual TN
- the media gateway channel for voice media conversion between an IP packet-switched network, and the circuit-switched private and public telephone network.

During start-up, the i2004 Internet Telephone registers itself with the terminal proxy server on the ITG Line 2.1 card and also the Virtual TN with configuration parameters on the Meridian/Succession CSE 1000. The media gateway channel provides an interface between the packet switched IP network and the circuit switched network of the Meridian/Succession CSE 1000.

Configuring DHCP server to support Full DHCP mode

The DHCP capability feature of the i2004 Internet Telephone, enables the set to get network configuration parameters and specific connect server parameters. This section describes the i2004 Internet Telephone's unique class identifier and requested network configuration and connect server parameters for automatic configuration.

i2004 Internet Telephone class identifier

The i2004 Internet Telephone is designed with a unique class identifier that the DHCP server can use to identify the i2004 Internet Telephone. All i2004 Internet Telephones use the same text string, "Nortel-i2004-A", to identify itself. The ASCII string is sent inside the Class Identifier option of the i2004 Internet Telephone's DHCP messages.

The DHCP server also includes this string in its responses to the i2004 Internet Telephone DHCP client. This makes it possible to notify the i2004 Internet Telephone that the server is i2004 Internet Telephone-aware, and that it is safe to accept the server's offer. This string appears in the beginning of the list of the specific ITG Line 2.1 card information that the i2004 Internet Telephone DHCP client requests.

When the DHCP server has been configured to recognize the i2004 Internet telephone as a special class, the DHCP server can treat the i2004 Internet Telephone differently than other DHCP clients. DHCP host configuration parameters can then be grouped by class and only information relevant to the i2004 DHCP client is supplied. In particular, the i2004 Internet Telephone connect server parameters.

Also, the administrator can design the network according to the client's class, if necessary, making maintenance easier. Depending on the capabilities and limitations of the DHCP server used and the design of the network, some of these advanced functions may not be available.

Requested Network Configuration Parameters

Nortel's i2004 Internet Telephone, using Full DHCP mode, has the ability to be configured automatically by an i2004 Internet Telephone-aware DHCP server by requesting a list of connect server configuration parameters. The i2004 Internet Telephone uses DHCP, an industry standard protocol, to request and receive the information.

i2004 Internet telephones operating in Partial DHCP mode can receive an IP address from any DHCP server. In Full DHCP mode, the server must be configured to respond to the request for the vendor specific encapsulated options.

Table 14 lists the network configuration parameters requested by the i2004 Internet Telephone in the Parameter Request List option (Option Code 55) in the DHCPDISCOVER and DHCPREQUEST messages. The DHCPOFFER and the DHCPACK reply messages from the DHCP server must contain the options in Table 14.

Table 14
i2004 Internet Telephone Network Configuration Requirements

Parameter Request (Option Code 55)	DHCP Option Code
Subnet mask - the client IP subnet mask.	1
Router/Gateway(s) - the IP address of the client’s default Gateway.	3
Lease Time - implementation varies according to DHCP server.	51
Renewal time - implementation varies according to DHCP server.	58
Rebinding interval - implementation varies according to DHCP server.	59
ITG Line 2.1 Site Specific or Vendor Specific encapsulated/site options	43, 128, 144, 157, 191, 251

The first five parameters in Table 14 are standard DHCP options and have predefined option codes. The last parameter is for ITG Line 2.1 card information, which does not have a standard DHCP option. The server administrator must define a vendor encapsulated and/or site specific option to transport this information to the i2004 Internet Telephone.

This non-standard information includes the unique string indentifying the i2004 Internet telephone and the connect server parameters for the primary and secondary servers. The i2004 Internet Telephone must receive the connect server parameters in order to connect to the ITG Line 2.1 node.

The administrator must use one of the five site specific or vendor encapsulated option codes to implement the ITG Line 2.1 card information. Then, this user-defined option can be sent as is, or encapsulated in a Vendor Encapsulated option with option code 43. Which method to use depends on the DHCP server's capabilities and what options are already in use by other vendors.

The i2004 Internet Telephone rejects any DHCP Offers/Acks that does not contain:

- A Router option. The i2004 requires a default gateway (router)
- A Subnet Mask option
- Either
  - — a Vendor Specific option < see Note 1: >
  - — a Site Specific option < see Note 2: >

  Note 1: The Vendor Specific option is 43. Windows NT DHCP Server (up to SR4) supports only 16 octets of data for the vendor-specific option, which is insufficient to support the minimum length of the i2004-specific string. If you use a Windows NT DHCP Server, you must select the Site Specific option to accommodate the i2004-specific string.

  Note 2: The Site Specific options are all DHCP options between 128 (0x80) and 254 (0xFE). These options are reserved for Site Specific use by the DHCP RFCs.

Format for Nortel Networks i2004 Internet Telephone DHCP Class Identifier Option

All i2004 Internet Telephones fill in the Class ID option of the DHCP Discovery and Request messages with the null-terminated, ASCII-encoded string Nortel-i2004-A, where A identifies the version number of the i2004 Internet Telephone.

The Class Identifier Nortel-i2004-A must be unique in the DHCP server domain.

Format for Nortel Networks i2004 Internet Telephone DHCP Encapsulated Vendor Specific Option

The following definition describes the Nortel i2004 specific, Encapsulated Vendor Specific option. This option must be encapsulated in a DHCP Vendor Specific Option (Refer to RFC 1533) and returned by the DHCP server as part of each DHCPOFFER and DHCPACK message for the i2004 to accept these messages as valid. The i2004 will extract the relevant information out of this option and use it to configure the connect server IP address, the port number (4100), a command value of one, and retry count for the primary and secondary connect server.

Note that either this encapsulated vendor specific option or a similarly encoded site-specific option must be sent (see below), that is, configure the DHCP server to send one or the other - not both. The choice of using either Vendor Specific or Site Specific option is provided to allow WinNT DHCP servers to be used with the i2004 Internet Telephone (WinNT servers do not properly implement the Vendor Specific Option, and as a result, WinNT implementations must use the Site Specific version).

The format of the Encapsulated Vendor Specific option is Type, Length, and Data as shown below.

Type (1 octet):

There are five choices:

0x80 (Site Specific option 128)

0x90 (Site Specific option 144)

0x9d (Site Specific option 157)

0xbf (Site Specific option 191)

0xfb (Site Specific option 251)

Providing a choice of five types allows the i2004 to work in environments where the initial choice may already be in use by a different vendor. Pick only one value for TYPE byte.

Length (1 octet)

The Length value is variable. Count only the number of octets in the data field (see below).

Data field (variable number of octets)

The data field contains an ASCII-encoded character string that can be optionally null-terminated.

"Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr;iii.jjj.kkk.lll:pppp,aaa,rrr."

where,

"Nortel-i2004-A" - uniquely identifies that this is the Nortel option and is a response from a server that can provide the correct configuration information to the i2004 Internet Telephone.

Additionally, the "-A" signifies the version of the i2004 Internet Telephone.

ASCII "," separates fields

ASCII ":" separates the IP address of the bootstrap server node IP from the Transport Layer port number

ASCII ";" separates the Primary from Secondary bootstrap server information. The bootstrap server is the Active Leader of the ITG Line 2.1 node.

ASCII "." signals end of structure

"iii.jjj.kkk.lll:ppppp" - identifies IP address and port number for server (ASCII encoded decimal)

"aaa" - identifies Action for server (ASCII encoded decimal, range 0..255)

"rrr" - identifies retry count for server (ASCII encoded decimal, range 0..255)

This string may be NULL terminated although the NULL is not required for parsing.

Notes:

1 "aaa" and "rrr" are ASCII encoded decimal numbers with a range of 0..255. They identify the "Action Code" and "Retry Count", respectively, for the associated TPS server. Internally to i2004 they will be stored as 1 octet (0x00..0xFF). Note that these fields must be no more than 3 digits long.

2 First server is always considered "Primary", second server always considered "Secondary".

3 If only one server is required, terminate primary TPS sequence immediately with "." instead of ";" for example, "Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr."

4 Valid options are one or two servers (0 or 3 is not allowed). However, it is recommended that the two server option be used. For i2004 Internet Telephone firmware version 3002B00, the valid option is two servers.

Note: If there is only one connect server (i.e. only one ITG 2.0 node is configured), enter the same information for server 1 and server 2.

5 Action code values:

0- reserved

1- UNIStim Hello (currently only this type is a valid choice)

2..254 - reserved

255 - reserved

6 iii,jjj,kkk,lll are ASCII encoded, decimal numbers representing the IP address of the server. They do not need to be three digits long as the **.** and **:** delimiters will guarantee parsing. For example, '001', '01' and '1' would all be parsed correctly and interpreted as value 0x01 internal to the i2004. Note that these fields must be no more than 3 digits long each.

7 ppppp is the port number in ASCII encoded decimal. It does not need to be 5 digits long as the **:** and **,** delimiters will guarantee parsing. For example, '05001', '5001', '1', '00001' etc. would all be parsed correctly and accepted as correct. The valid range is 0-65535 (stored internally in i2004 as hexadecimal in range 0..0xFFFF). Note that this field must be no more than 5 digits long.

8 In all cases, the ASCII encoded numbers are treated as decimal values and all leading zeros are ignored. More specifically, a leading zero does not change the interpretation of the value to be OCTAL encoded. For example, 0021, 021 and 21 are all parsed and interpreted as decimal 21.

Format for Nortel Networks i2004 Internet Telephone DHCP Site Specific Option

The following definition describes the Nortel i2004 specific, Site Specific option. This option uses the "reserved for site specific use" DHCP options (128 to 254 - Refer to RFC 1541 and RFC 1533) and must be returned by the DHCP server as part of each DHCP OFFER and ACK message for the i2004 to accept these messages as valid. The i2004 will pull the relevant information out of this option and use it to configure the IP address etc. for the primary and (optionally) secondary TPS's. Note that either this site specific option must be present OR a similarly encoded vendor-specific option must be sent (as described above), that is, configure the DHCP server to send one or the other - not both. The choice of using either Vendor Specific or Site Specific options was provided to allow WinNT DHCP servers to be used with the i2004 (WinNT servers do not properly implement the Vendor Specific Option and as a result, WinNT implementations must use the Site Specific version).

Format of field is: Type, Length, Data.

Type (1 octet):

5 choices 0x80, 0x90, 0x9d, 0xbf, 0xfb (128, 144, 157, 191, 251).

Providing a choice of five types allows the i2004 to work in environments where the initial choice may already be in use by a different vendor. Pick only one TYPE byte.

Length (1 octet):

variable - depends on message content.

Data (length octets):

- ASCII based

- format

"Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr;iii.jjj.kkk.lll:pppp,aaa,rrr."

where,

"Nortel-i2004-A" - uniquely identifies this as the Nortel option

Additionally, the "-A" signifies the version. Future enhancements could use "-B" for example.

ASCII "," is used to separate fields

ASCII ";" is used to separate Primary from Secondary server info

ASCII "." is used to signal end of structure

"iii.jjj.kkk.lll:ppppp" - identifies IP:port for server (ASCII encoded decimal)

"aaa" - identifies Action for server (ASCII encoded decimal, range 0-255)

"rrr" - identifies retry count for server (ASCII encoded decimal, range 0-255)

This string may be NULL terminated although the NULL is not required for parsing.

Notes:

1 "aaa" and "rrr" are ASCII encoded decimal numbers with a range of 0-255. They identify the "Action Code" and "Retry Count", respectively, for the associated TPS server. Internally to i2004 they will be stored as 1 octet (0x00..0xFF). Note that these fields must be no more than 3 digits long.

2 First server is always considered "Primary", second server always considered "Secondary".

3 If only one server is required, terminate primary TPS sequence immediately with "." instead of ";" for example "Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr."

4 Valid options are one or two servers (0 or 3 is not allowed). However, it is recommended that the two server option be used. For i2004 Internet Telephone firmware version 3002B00, the valid option is two servers.

Note: If there is only one connect server (i.e. only one ITG 2.0 node is configured), enter the same information for server 1 and server 2.

5 Action code values:

0 - reserved

1 - UNIStim Hello (currently only this type is a valid choice)

2-254 - reserved

255 - reserved

6 iii,jjj,kkk,lll are ASCII encoded, decimal numbers representing the IP address of the server. They do not need to be 3 digits long as the. and: delimiters will guarantee parsing. For example, '001', '01' and '1' would all be parsed correctly and interpreted as value 0x01 internal to the i2004. Note that these fields must be no more than 3 digits long each.

7 ppppp is the port number in ASCII encoded decimal. It does not need to be 5 digits long as the **:** and **,** delimiters will guarantee parsing. For example, '05001', '5001', '1', '00001' etc. would all be parsed correctly and accepted as correct. The valid range is 0-65535 (stored internally in i2004 as hexadecimal in range 0..0xFFFF). Note that this field must be no more than 5 digits long.

8 In all cases, the ASCII encoded numbers are treated as decimal values and all leading zeros are ignored. More specifically, a leading zero does not change the interpretation of the value to be OCTAL encoded. For example, 0021, 021 and 21 are all parsed and interpreted as decimal 21.

End of Notes

Installation and configuration of ITG Line 2.1 node

Contents

This section contains information on the following topics:

Overview

This chapter explains how to install and configure new Internet Telephony Gateway (ITG) Line 2.1 nodes, cards and associated cables; configure ITG Line 2.1/i2004 VTN data on Meridian/Succession Communication Server for Enterprise (CSE) 1000; configure ITG Line 2.1 data on Meridian Administrative Tools (MAT) and transmit to ITG Line 2.1 cards; upgrade ITG Line 2.1 card software; upgrade i2004 Internet Telephone firmware.

The following is a list of procedures contained in this chapter:

- Procedure 1, “ITG Line 2.1 card installation” on page 113
- Procedure 2, “Remove existing I/O panel Filter Connector” on page 115
- Procedure 3, “Installing the NTMF94EA E-LAN, T-LAN, serial interface cable” on page 117

- Procedure 4, “Configure the E-LAN IP address for the Meridian/Succession CSE 1000 active ELNK Ethernet interface” on page 119
- Procedure 5, “Add an ITG Line 2.1 node manually” on page 128
- Procedure 6, “Configure ITG Line 2.1 card properties” on page 131
- Procedure , “Configure DSP profile data” on page 132
- Procedure 8, “Configure Meridian 1 Call Server E-LAN IP address and TLAN voice port” on page 136
- Procedure 10, “Configuring security for MAT SNMP access” on page 140
- Procedure 9, “Configuring SNMP traps and ELAN GW Routing table” on page 138
- Procedure 11, “Configuring MAT/OTM alarm notification feature” on page 141
- Procedure 12, “Set the Leader 0 IP address” on page 147
- Procedure 13, “Transmit node and card properties to Leader 0” on page 149
- Procedure 14, “Transmit card properties to all cards in the node” on page 151
- Procedure 15, “Verify card software and i2004 Internet Telephone firmware” on page 153
- Procedure 16, “Upgrade ITG Line card software from the web” on page 154
- Procedure 17, “Upgrade i2004 Internet Telephone firmware” on page 157

Be sure to read the Engineering guidelines section before you install an ITG Line 2.1 node.

Install the hardware components

Install and cable ITG Line 2.1 card

Each ITG Line 2.1 card requires two slots in the Meridian/Succession CSE 1000 IPE shelf. Only the left slot of the card connects to the Meridian/Succession CSE 1000 IPE Backplane and I/O panel.

You can install a maximum of eight ITG cards in an IPE shelf in a large system. The ITG card can occupy any two adjacent slots in an IPE shelf, with the left slot of the card plugging into slots 0 to 6 and 8 to 15. You cannot plug in the left slot of an ITG card in slot 7, because the XPEC card is situated in-between slots 7 and 8.

To allow a module to hold the maximum number of ITG cards, install each card with the left slot of the card inserted into an even-numbered slot.

> **CAUTION**
> Wear an electrostatic discharge strap when handling ITG cards. As an additional safety measure, handle all cards by the edges and, when possible, with the loosened packaging material still around the component.

Procedure 1
ITG Line 2.1 card installation

1 For each ITG Line 2.1 card in the node, identify the IPE card slot selected for the ITG Line card. Use the information from the "ITG Line 2.1 card installation summary sheet" on page 94, and Table 15 on page 114.

Note: Even though the ITG Line 2.1 card is a two-slot card, only the left slot is counted for the card slot number. Example: the slot number is 2 for an ITG Line 2.1 card installed in slots 2 and 3.

2 Remove any existing I/O panel cabling associated with any card previously installed in the selected card slot.

3 Pull the top and bottom locking devices away from the ITG Line 2.1 Leader 0 card faceplate.

4 Insert the ITG Line 2.1 card into the card guides and gently push it until it makes contact with the Backplane connector. Hook the locking devices.

Note 1: The red LED on the faceplate remains lit until the card is configured and enabled in software, at which point it turns off.

Note 2: The faceplate display window displays startup selftest results (T:xx) and status messages. A display "F:xx" indicates a failure of the self-test. It is normal for the card to display "F:10" during the start-up self test. F:10 indicates that the self-test did not find a Security Device. The ITG Line 2.1 card does not have a security device. Some failures indicate that the card must be replaced.

Refer to "Faceplate maintenance display codes" on page 206 for a listing of display codes.

End of Procedure

Table 15
ITG installation by module type.

Meridian/Succession CSE 1000 Modules	ITG Card Slots
NT8D37BA/EC IPE modules, NT8D11BC/ED CE/PE modules	All available IPE card slots.
NT8D37AA/DC IPE modules	0, 4, 8, and 12
NT8D11AC/DC CE/PE modules	0

Install NTCW84JA ITG-specific I/O Panel Filter Connector for Large System

Note: This NTCW84JA ITG-specific Filter Connector is not required on Option 11C and 11C Mini systems.

> **CAUTION**
>
> For large systems manufactured during the period of 1998-1999 and shipped in North America, the IPE modules have the NT8D81BA Backplane to I/O Panel ribbon cable assembly with a non-removable Filter Connector. The NT8D81BA is compatible with 10BaseT T-LAN, but if you require a 100BaseT T-LAN, you need to order the NT8D81AA Backplane to I/O Panel ribbon cable assembly to replace it. Do not try to install the NTCW84JA ITG-specific Filter Connector onto the existing non-removable Filter Connector.

Remove existing I/O panel Filter Connector

The standard I/O Filter Connector is shielded metal with a black plastic insert connector. The NTCW84JA connector uses yellow warning labels to indicate EMC filtering modifications and which MDF connection points can support 100BaseT connections.

Procedure 2
Remove existing I/O panel Filter Connector

1 Before any of the following steps, remove the ITG pack, or any other IPE pack, from the IPE shelf card slot corresponding to the I/O Panel connector to be removed.

Note: Make sure to use the I/O panel connector which corresponds to the left slot number of the DCHIP card.

2 Remove the NT8D81AA Backplane to I/O Panel ribbon cable assembly, which is connected to the Backplane side of the existing block, by releasing the latching pins on the filter block and pulling the NT8D81AA cable away.

3 Unscrew the existing Filter Connector from the I/O panel. There is one screw on the lower front of the connector and one screw on the upper back of the connector. Remove the connector.

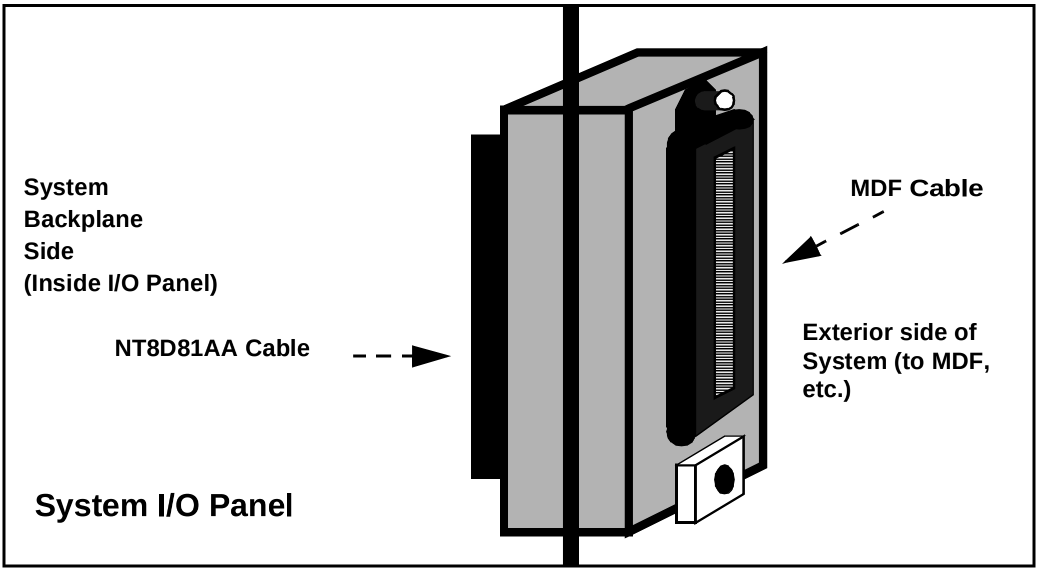
4 Re-position the new NTCW84JA Filter Connector in the now vacant I/O panel opening. (See Figure 16 on page 116.)

5 Attach the new NTCW84JA ITG-specific Filter Connector to the I/O panel by securely fastening the top back screw and the bottom front screw.

6 Reconnect the NT8D81AA cable and secure it in place by snapping shut the locking latches provided on the NTCW84JA connector.

End of Procedure

Figure 16
NTCW84JA 50 pin ITG-specific I/O Panel Filter Connector for Large System



Install the NTMF94EA E-LAN, T-LAN, serial interface cable

The NTMF94EA cable provides the E-LAN, T-LAN and serial interface for the NT8R17 IP Line card. Refer to "NTMF94EA I/O cable" on page 235 for pinouts and technical specifications on the NTMF94EA cable.

Procedure 3
Installing the NTMF94EA E-LAN, T-LAN, serial interface cable

> **IMPORTANT**
>
> You must plug all IP Line 2.0 card T-LAN interfaces belonging to the same ITG node into the same T-LAN hub.
>
> Plug all IP Line 2.0 card E-LAN interfaces belonging to the same node into the same E-LAN hub.

1 On large systems, connect the NTMF94EA E-LAN, T-LAN, and RS232 Serial Maintenance I/O cable to the I/O panel connector for the left hand card slot.

If you have an Option 11C or 11 C Mini, connect the cable to the I/O connector in the cabinet that corresponds to the IP Line card slot (see Figure 35 on page 237).

2 Connect a shielded Category 5 cable from the customer's T-LAN hub or switch equipment to the port labeled "T-LAN".

3 Connect a shielded Category 5 cable from the customer's E-LAN hub or switch equipment to the port labeled "E-LAN".

4 Install the NTAG81CA serial cable into the faceplate Maintenance port. You will use this connection in Procedure 12 to configure the IP address for Leader 0. If required, use the NTAG81BA maintenance extender cable

Note: Alternatively, for a permanent connection to the maintenance port, use the DB9 female connector on the NTMF94BA breakout cable to connect a modem (via a null modem) or directly to a local TTY terminal.

> **WARNING**
>
> The serial maintenance ports presented at the faceplate and at the backplane are identical. Do not connect a terminal to both access points simultaneously. This will result in incorrect and unpredictable operation of the ITG card.

Note 1: The hub LEDs and the faceplate link LEDs light when you connect the card to the WAN/LAN through the T-LAN port.

Note 2: Refer to “IP Network engineering guidelines” on page 55 for more details about engineering and connecting the LAN/WAN.

End of Procedure

Configure ITG Line 2.1/i2004 data on the Meridian/Succession CSE 1000

Summary of steps:

- Configure IP address for the Meridian/Succession CSE 1000 Ethernet Interface (LD 117) . .
- Configure bandwidth management zones (LD 117) . .
- Configure ITG physical TNs (LD 14) . .
- Configure virtual superloops for i2004 Internet Telephones (LD 97) . .
- Configure i2004 Meridian/Succession CSE 1000 features (LD11) . .

Before you proceed:

- Verify the Meridian/Succession CSE 1000 software release running on your system. The minimum required software release to support ITG Line 2.1 is R25.15.
- Verify the ISM System Limit in Overlay 32. The ISM system limit must have sufficient unused units to support the number of i2004 sets you are installing. Refer to the *Meridian/Succession CSE 1000 System Maintenance Guide* (NTP 553-3001-511).
- Expand the ISM System Limit, if required, by ordering additional ISM Parameters (NTZC82AA). Refer to Table 2, “Meridian/Succession CSE 1000 ITG Line 2.1 package components,” on page 17 and “Ordering rules for ITG Line 2.1” on page 19.

  Note: In the following procedures, the term Intrazone means within the same zone, and Interzone means between two different zones.

Configure IP address for the Meridian/Succession CSE 1000 Ethernet Interface (LD 117)

Procedure 4
Configure the E-LAN IP address for the Meridian/Succession CSE 1000 active ELNK Ethernet interface

1 Go into Overlay 117.

2 Create host entries with IP address on the ELAN subnet by entering one of the following commands:

NEW HOST PRIMARY_IP xx.xx.xx.xx

NEW HOST SECONDARY_IP xx.xx.xx.xx (for Option 61C and Option 81/81C only)

3 Assign host entry IP address to active and inactive ELNK interfaces on ELAN by entering one of the following commands:

CHG ELNK ACTIVE PRIMARY_IP

CHG ELNK INACTIVE SECONDARY_IP (for Dual CPU only)

4 Verify your IP address for the Ethernet by entering the following command: **PRT ELNK.**

5 Enter: **Update DBS.**

6 Go to Overlay 137. Check the status of the Ethernet interface by entering the command: **STAT ENLK**. If the ELNK is disabled, enable it by entering: **ENL ELNK**.

End of Procedure

Configure bandwidth management zones (LD 117)

In Overlay 117 you can define up to 256 zones. The Audio Connection Proxy uses the zones for bandwidth management.

Table 16 on page 120, list the four zone parameters as:

- p1 - Total bandwidth (kbps) available for Intrazone calls
- p2 - Defines the codec for Intrazone calls (i.e. preserve voice quality or preserve bandwidth). BQ provides Best Quality but uses the most

bandwidth, whereas BB uses the least amount of Bandwidth but reduces voice quality

- p3 - The total bandwidth available for Interzone calls
- p4 - The preferred strategy for the choice of the codec for Interzone calls

Overlay 117 also includes DIS and ENL commands to disable or enable a zone. When you create a zone, its default state is enabled.

> ***Note:*** When defining zones in Overlay 117, you must begin with Zone 0.

Table 16
LD 117 bandwidth management zones configuration

=> Command	Description
NEW ZONE xxx p1 p2 p3 p4	User creates a new zone, where: xxx = zone number = (0) - 255 p1 = Intrazone available bandwidth (kbps) = 0 - (10000) - 100000 p2 = Intrazone preferred strategy = BQ for Best Quality or BB for Best Bandwidth p3 = Interzone available bandwidth (kbps) = 0 - (10000) - 100000 p4 = Interzone preferred strategy = BQ or BB
New ZONE xxx	User creates a new zone with default values for the parameters: p1 = 10000 (kbps) p2 = BQ p3 = 10000 (kbps) p4 = BQ
CHG ZONE xxx p1 p2 p3 p4	User changes parameters of a zone. All parameters must be re-entered, even those that are unchanged.
OUT ZONE xxx	User removes a zone.

Table 16
LD 117 bandwidth management zones configuration

=> Command	Description
DIS ZONE xxx	Allows user to disable a zone. When you disable zone, no new calls are established inside, from or toward this zone.
ENL ZONE xxx	Allows user to enable a zone.
PRT ZONE xxx	Prints zone and bandwidth information.

Configure ITG physical TNs (LD 14)

Use LD 14 to define ITG Line 2.1 card physical TNs. LD 14 includes a new prompt **IPTN** (ITG Physical TN) to differentiate the ITG voice media gateway channels from the IP trunk units of an ITG trunk 2.0 card.

Table 17
Configure ITG physical TNs in LD 14

Prompt	Response	Description
REQ	New 24	Create 24 ITG voice media gateway channels on an ITG Line 2.1 card.
TYPE	TIE	TIE Trunk. There is no route datablock required for IPTNs.
TN	l s c u c u	TN of the first ITG Physical TN (large system) (Option 11C TN format.)
DES	aa.......a	ITG Physical TN.
XTRK	itg2	ITG2 is the NTVQ55AA ITG line card which occupies 2 card slots.
MAXU	24	Maximum number of voice media gateway channels on the ITG Line 2.1 card.
IPTN	YES	ITG Physical TN.

Table 17
Configure ITG physical TNs in LD 14

Prompt	Response	Description
ZONE	0 - 255	Zone number to which this ITG Physical TN belongs. You must verify that the zone exists in Overlay 117.
CUST	0 - 99	The customer to which the IPTN resources are assigned ***Note:*** This means that for multi-customer Meridian/Succession CSE 1000 systems, each customer must have a dedicated ITG line node for i2004 Internet Telephones.

Use Overlay 14 to disable the newly-created IPTN cards. The MAT ITG IP Phones application requires ITG Line 2.1 cards to be in a disabled state before transmitting card properties.

Configure virtual superloops for i2004 Internet Telephones (LD 97)

You must configure one or more virtual superloops to support i2004 Internet Telephones Virtual TNs (VTNs).

Large Systems

In large systems, virtual superloops contend for the same range of loops with phantom, standard and remote superloops, digital trunk loops and all service loops. Virtual superloops can reside in physically equipped network groups, or in virtual network groups.

Without FIBN, Package 365, there is a maximum of five network groups available, 0 - 4. With Package 365, there are a maximum of eight network groups, 0 - 7. For normal traffic engineering, provision up to 1024 VTNs on a single virtual superloop for a large system. For non-blocking, do not exceed 120 VTNs on a single virtual superloop, for a large system.

It is recommended that you start configuring Virtual Superloops in the highest non-physically equipped group available. Table 17 lists the prompts and responses required to configure virtual superloops in Overlay 97.

Table 18
Virtual Superloop configuration in LD 97

Prompt	Response	Description
REQ	CHG	Change.
TYPE	SUPL	Superloop
SUPL	Vxxx	V stands for a virtual superloop and xxx is the number of the virtual superloop. xxx = 0-156 and multiple of four for large systems without FIBN package 365. xxx = 0-252 and multiple of four for large systems with FIBN package 365. xxx = 96-112 and multiple of four for Option 11C and 11C Mini.

Small systems

In small systems, virtual superloops contend for the same range of superloops, 96- 112, with phantom superloops.

Up to 128 VTNs can be configured on a single virtual superloop for a small system, for a maximum number of 640 VTNs in each system.

in small systems, mapping virtual superloops to virtual cards is the same as mapping phantom superloops to phantom cards. Refer to Table 19.

Table 19
Virtual superloop/virtual card mapping for small systems

SUPL	Card
96	61-64
100	65-68
104	69-72
108	73-76
112	77-80

Configure i2004 Meridian/Succession CSE 1000 features (LD11)

The existing ISM header that is printed at the start of Overlay 11 includes the new ISM limit for the i2004 Internet Telephone. Refer to Table 20 to configure the i2004 Internet Telephone in Overlay 11.

Table 20
LD 11 Configure i2004 Internet Telephone (Part 1 of 2)

Prompt	Response	Description
REQ:		Action request.
	NEW	New
	CHG	Change
	PRT	Print
	OUT	Out
	CPY	Copy
	MOV	Move
TYPE:	I2004	For model i2004 Internet Telephone. Meridian/Succession CSE 1000 accepts this response if it is equipped with packages 88 and 170.
TN	l s c u	Enter loop (virtual loop), shelf, card and unit (terminal number), where unit = 0 - 31
	c u	Slot (virtual slot) and unit for Option 11C. ***Note:*** See Table 19 for virtual superloop to virtual card slot mapping for small systems.
des	a...z	ODAS telephone designator
CUST	0-99	Customer number.
...	...	...
ZONE	0-255	Zone number to which this i2004 Internet Telephone belongs. The zone prompt only applied when TYPE=i2004 ***Note:*** You must verify that the zone number exists in LD 117.

Table 20
LD 11 Configure i2004 Internet Telephone (Part 2 of 2)

Prompt	Response	Description
...	...	...
CLS	aaaa	ADD - Automatic Digit Display, default for i2004 Internet Telephone For a complete list of responses, refer to the *Software Input/Output Guide - X11 Administration* (553-3001-311).
KEY	xx aaa yy zz...zz	Telephone function key assignments where: xx = Keys 0 - 5. These are self-labeled physical keys that can be programmed with any feature. aaa = Key name or function yyy, zzz = additional information required for the key. ***Note:*** Keys 16 - 26 are reserved for dedicated i2004 soft keys. Table 21 lists the dedicated i2004 Internet Telephone key name values (aaa). Other key name values can be found in the *Software Input/Output Guide - X11 Administration* (553-3001-311).

i2004 Internet Telephone dedicated soft keys

Table 21 describes the Meridian/Succession CSE 1000 features that can be assigned to dedicated soft Keys 16-26 on the i2004 Internet Telephone. Features that are not used can be removed from the dedicated soft keys. Some features will depend on the given Class of Service.

> ***Note:*** If you attempt to configure anything other than the permitted response, Meridian/Succession CSE 1000 generates an error code. For related error messages, see "SCH messages" on page 280.

Table 21
LD 11 i2004 Internet Telephone dedicated soft key assignment (Part 1 of 2)

i2004 Internet Telephone key number	Response(s) Allowed
Key 16	MWK, NUL MWK - Message Waiting key
Key 17	TRN, NUL TRN - Call Transfer key.
Key 18	A03 or A06, NUL AO3 - 3-party conference key. AO6 - 6-party conference key.
Key 19	CFW, NUL CFW - Call Forward key.
Key 20	RGA, NUL RGA - Ring Again key.
Key 21	PRK, NUL PRK - Call Park key.
Key 22	RNP, NUL RNP - Ringing Number pickup key
Key 23	SCU-Speed Call User SSU-System Speed Call User SCC - Speed Call Controller SSC - System Speed Call Controller NUL

Table 21
LD 11 i2004 Internet Telephone dedicated soft key assignment (Part 2 of 2)

i2004 Internet Telephone key number	Response(s) Allowed
Key 24	PRS, NUL PRS - Privacy Release key.
Key 25	CHG, NUL CHG - Charge Account key.
Key 26	CPN, NUL CPN - Calling Party Number key.

Configure ITG Line 2.1 data on MAT/OTM

This section uses the Meridian Administration Tools (MAT) 6.67.07 (with update disk and loss plan patch) and Optivity Telephone Management (OTM) 1.0 (or later) ITG IP Phones Application to manually add and configure an ITG card node. Multiple ITG Line 2.1 card nodes for i2004 Internet Telephones are configured and managed from the same MAT PC.

All IP addresses and subnet mask data must be in dotted decimal format. Convert subnet mask data from Classless Inter-Domain (CIDR) format.

Refer to the "ITG Line 2.1 card installation summary sheet" on page 94 for IP addresses and information required in this procedure.

Summary of steps:

- Manually add an ITG card node . .
- Configure ITG line card properties . .
- Configure DSP profile data . .
- Configure Meridian 1 Call Server ELAN IP address and TLAN voice port . .
- Configure Meridian 1 Call Server ELAN IP address and TLAN voice port . .
- Configure SNMP traps and ELAN GW Routing table . .

- Configure security for SNMP access . .
- Configure alarm notification features in MAT . .

Manually add an ITG card node

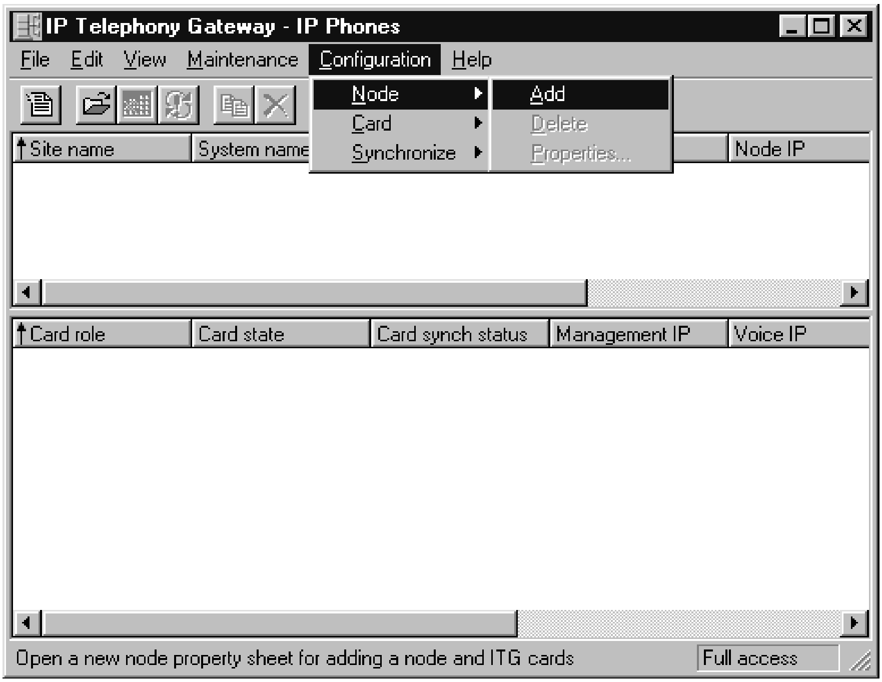
Procedure 5
Add an ITG Line 2.1 node manually

1 Launch MAT/OTM.

a. In the MAT/OTM Navigator window, click on **Services** to expand.

b. Double-click **ITG IP Phones**. The **ITG IP Phones** window opens (see Figure 17 on page 128).

Figure 17
IP Telephony Gateway - IP Phones main window



2 Click **Configuration | Node | Add.** The **Add Node** dialog box appears.

3 Click **OK** to accept the default setting "Define node configuration manually". The **New ITG Node** General tab appears (see Figure 18 on page 130).

4 Enter **Node Location** data from the **New ITG Node General tab:**

- **a.** Select a MAT/OTM site, MAT/OTM system and customer number.
- **b.** Type in a **node number** (one to three digits).The Node Number field in the tab corresponds to the Node ID field in the i2004 Internet Telephone configuration.
- **c.** Write down the node number, which is used in the i2004 Internet Telephone configuration.

5 Enter **Network Connections** data.

- **a.** For ITG Line 2.1, you must check the option, "Use separate subnets for voice and management".

CAUTION
You must use the separate subnets option to achieve acceptable performance for ITG Line 2.1.

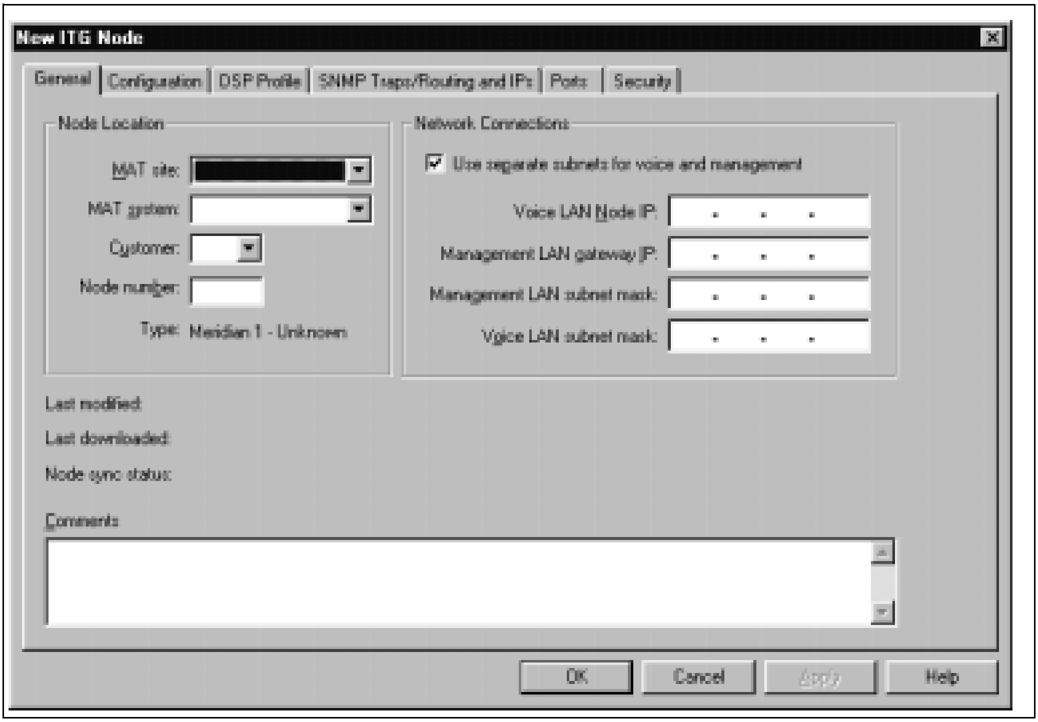
- **b.** Enter **Voice LAN Node IP address** (in dotted decimal format). Press the space bar to move between each decimal point. The Voice LAN Node IP is on the TLAN.
- **c.** Enter **Management LAN Gateway IP address** (in dotted decimal format). This is the IP address of the router interface on the ELAN, if present. If there is no management LAN gateway, enter: **0.0.0.0**
- **d.** Enter **Management LAN subnet mask address** (in dotted decimal format).
- **e.** Enter **Voice LAN subnet mask address** (in dotted decimal format).

6 Click the **Configuration** tab. See Procedure 6 on page 131.

> **CAUTION**
>
> **Do not click OK at this point. If you click OK you will exit the General Tab Node properties configuration without saving any of the changes.**

End of Procedure

Figure 18
New ITG Node General tab



Configure ITG line card properties

Procedure 6
Configure ITG Line 2.1 card properties

If the IP Network administrator provides IP addresses and subnet masks in CIDR format, e.g. "10.1.1.10/24", you must convert the subnet mask to dotted decimal format. See Appendix D: "Subnet mask conversion from CIDR to dotted decimal format" on page 271 for help.

> ***Note 1:*** On the Configuration tab, you can Add, Change or Delete the ITG Line 2.1 cards in the node one at a time.

> ***Note 2:*** You cannot delete the Leader 0 card in the Configuration tab. You must delete the node in order to delete Leader 0.

1 Enter the **Card Properties** data for Leader 0 and Follower cards:

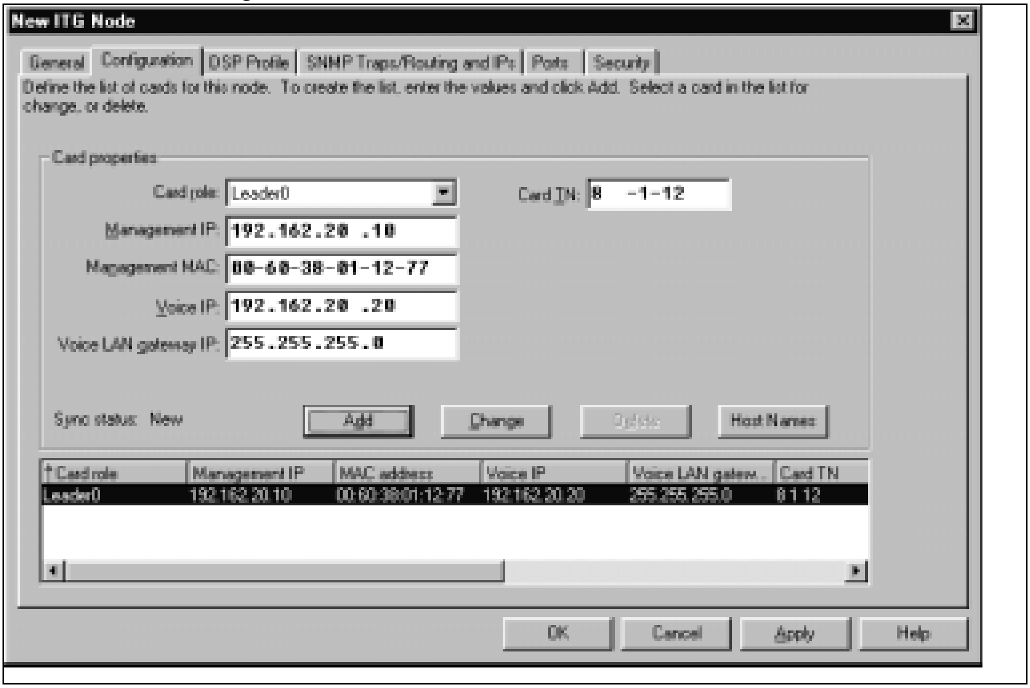
- **a.** **Define Card role:** Assign the Card role: Leader 0 to the first card you configure. For the remaining cards, assign the Card role: Follower.
- **b.** **Management IP:** This is the ELAN IP address for the card. MAT/OTM and Meridian/Succession CSE 1000 use this address to communicate with the card.
- **c.** **Management MAC:** This is the motherboard Ethernet address from your "ITG Line 2.1 card installation summary sheet" on page 94.
- **d.** **Voice IP:** This is the TLAN IP address for the card.
- **e.** **Voice LAN gateway IP:** This is the IP address of the router interface on the T-LAN.
- **f.** **Card TN** - For Large systems, enter Card TN (l s c) information. For Option 11C and 11C Mini, enter only the card number between 0-50. The card TN format is determined by the Meridian/Succession CSE 1000 system type which is configured in the MAT navigator.You must enter the correct system type in the MAT Navigator before you add the node.
- **g.** Click **Add**. The card role and address information appears in a working list at the bottom of the screen.

2 Click **Apply** to add the Card Properties to the Node.

Note: If you prematurely click OK at this point, you will exit from the window and the changes will be saved. Double-click the new node in the upper part of the main **ITG IP Phone** window to re-open Node Properties and complete the configuration procedures.

End of Procedure

Figure 19
New ITG Node - Configuration tab



Configure DSP profile data

The following procedure uses the DSP Profile tab and its two sub-tabs to configure DSP profile data.The DSP Profile tab has two sub-tabs - **General** and **Codec Options** that are described briefly below.

General sub-tab description and defaults

DiffServ/TOS - The DiffServ/TOS determines the priority of the packets in the IP network. The value entered depends on the equipment in the data network. The DiffServ/TOS applies to all cards in the ITG Line 2.1 node. It also applies to any i2004 Internet Telephones that register with this node.

Individual values are configurable for the voice and control DSCP values and can be configured to a number between 0 and 63 inclusive using the following (and above) versions:

- OTM 1.0.15
- MAT 6.67.07
- MAT 6.6 with the latest update disk from the ESD site

The values are set once for each system and apply to all packets sent by the ITG Line 2.1 card and the i2004.

With the versions listed above, the default value is 0. If DiffServ is implemented on the network, the IP Network Administrator should change the default value of 0 to another value. The recommended configuration values are:

- voice DSCP: 46 - Expedited Forwarding (EF)
- control DSCP: 40 - Class Selector 5 (CS5)

> ***Note:*** OTM 1.1 has 46 and 40 as the default values.

Loss and Level Plan - Determines parameters, such as transmission gain, that vary from country to country. The Loss and Level Plan values are stored in a file on the MAT/OTM PC. MAT/OTM reads the file to acquire the loss and level values for the selected country and places the values in a config.ini file on the ITG cards.

> ***Note:*** You **must** install the patch for MAT6.67.07 (with update disk and loss plan patch) to get the correct loss and level settings.

Enable Echo Canceller checkbox - Do **not** uncheck this box.

Echo canceller tail delay - Use the default value or select the maximum value available in the pull down menu.

Voice activity detection - The range is -20 to +10 dB. The default is -17.

Jitter buffer - The range is 0 - 200 ms. The default is 50 ms or the next highest setting that the device allows.

Codec options sub-tab description

The **Codec options** sub-tab presents a table of different sets of codec options identified by a codec setting index number. The lesser codec setting index corresponds to BQ (Best Quality) in Overlay 117 zone configuration. The greater codec setting index corresponds to BB (Best Bandwidth).

Procedure 7
Configuring DSP profile data

1. Click the **DSP Profile** tab if visible. The **DSP Profile** General tab appears.
2. Modify the DiffServ/TOS control and voice values if directed to do so by the IS manager.
3. Select your country in the Loss and Level plan pull-down box.
4. Leave the Codec values at their default settings (recommended).
5. Click **Apply** and click the **Codec Options** tab.

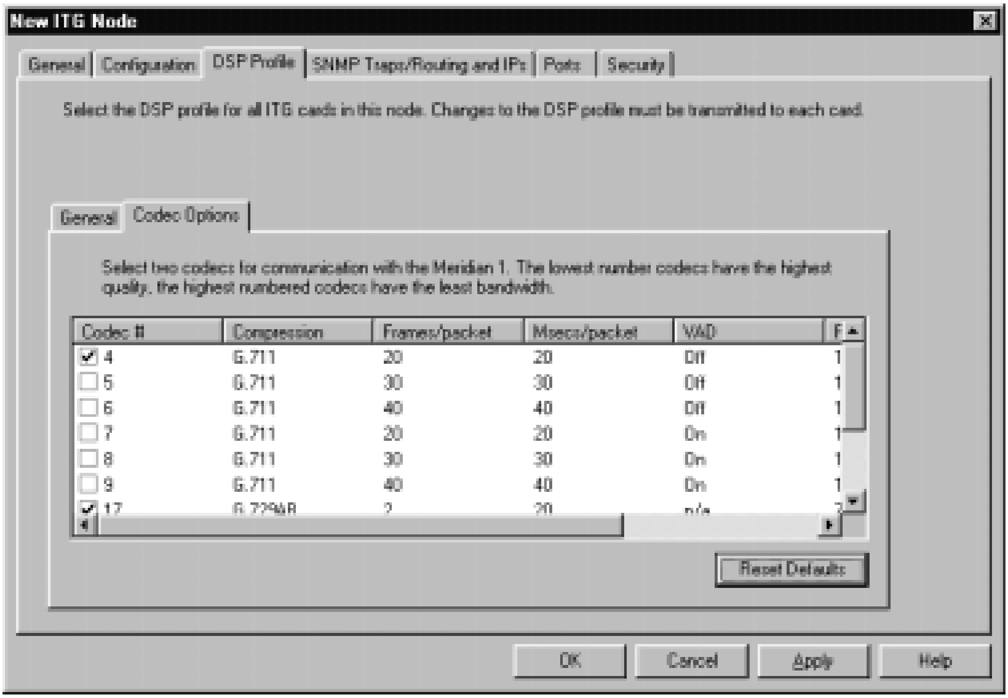
   Note: DSP Profile Codec Options tab contains a list of up to 32 codec settings for G.711, G.729A, and G.729AB for the ITG Line 2.1 card (see Figure 20 on page 135)

6 Check only two codec settings from the list. The default codec settings are 4 and 17.

7 Click **Apply**.

End of Procedure

Figure 20
New ITG Node DSP Profile tab (General tab)



Configure Meridian 1 Call Server ELAN IP address and TLAN voice port

Procedure 8
Configure Meridian 1 Call Server E-LAN IP address and TLAN voice port

1 Click on the **Ports tab**.

2 Enter the E-LAN Meridian 1 IP address and T-LAN voice port (see Figure 21).

Note: The E-LAN Meridian 1 IP address must correspond to the active ELNK IP address configured in Overlay 117. It must be in the same subnet as the E-LAN for the ITG Line 2.1 node.

CAUTION
Do not use the Restore Default button on the Ports tab. It will change the Meridian 1 ELAN IP address to an invalid address.

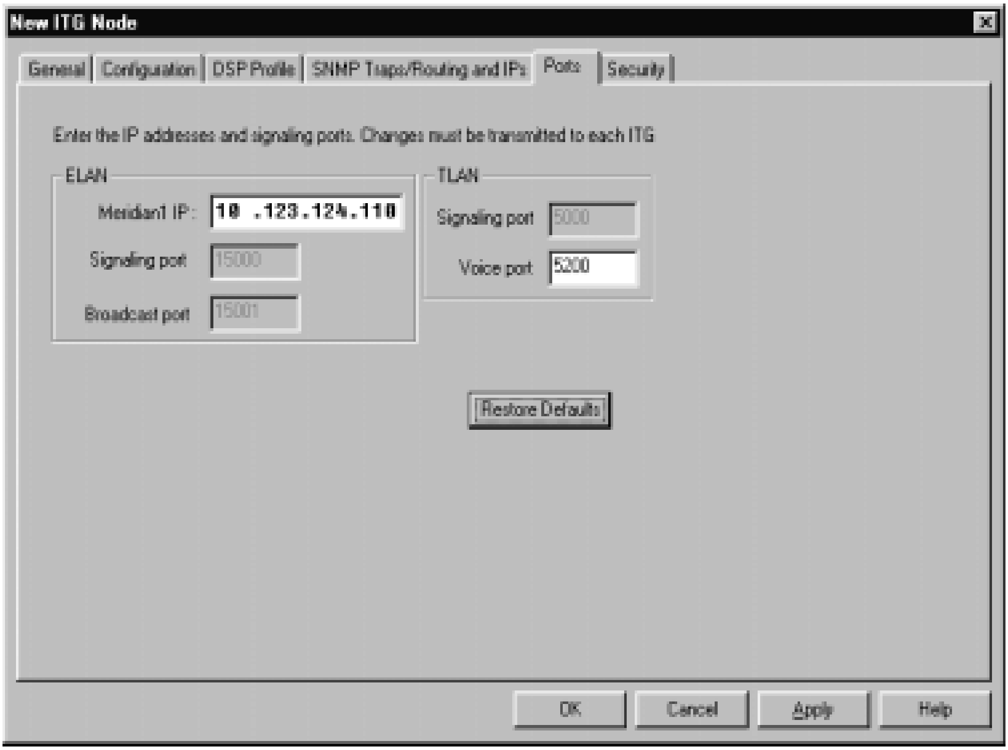
3 Change the T-LAN voice port only as instructed by the IP network administrator to improve quality of service for Internet telephony.

Note 1: The TLAN voice port range is 1024-65535. The default voice ports are 5200 - 5295. A check is performed to prevent the TLAN Voice and signaling ports from having the same range.

Note 2: The signaling occurs on ports 7300, 4100, 5100 and 5000

End of Procedure

Figure 21
New ITG Node (Ports tab).



Configure SNMP traps and ELAN GW Routing table

Procedure 9
Configuring SNMP traps and ELAN GW Routing table

1 Click the **SNMP traps** tab in the Node Properties window.

2 Check the "**Enable SNMP traps**" checkbox, if you are configuring one or more SNMP management IP addresses to receive SNMP traps from cards in the ITG line node.

3 To add an SNMP Manager IP address, type the IP address in the SNMP traps entry fields, and click **Add**. Add SNMP Manager IP addresses for:

- the local MAT/OTM PC
- PPP IP address configured in the Netgear RM356 Modem Router, or equivalent, on the E-LAN for the remote support MAT/OTM PC
- the SNMP manager for remote alarm monitoring
- Any remote MAT/OTM PCs on the customer's IP network.

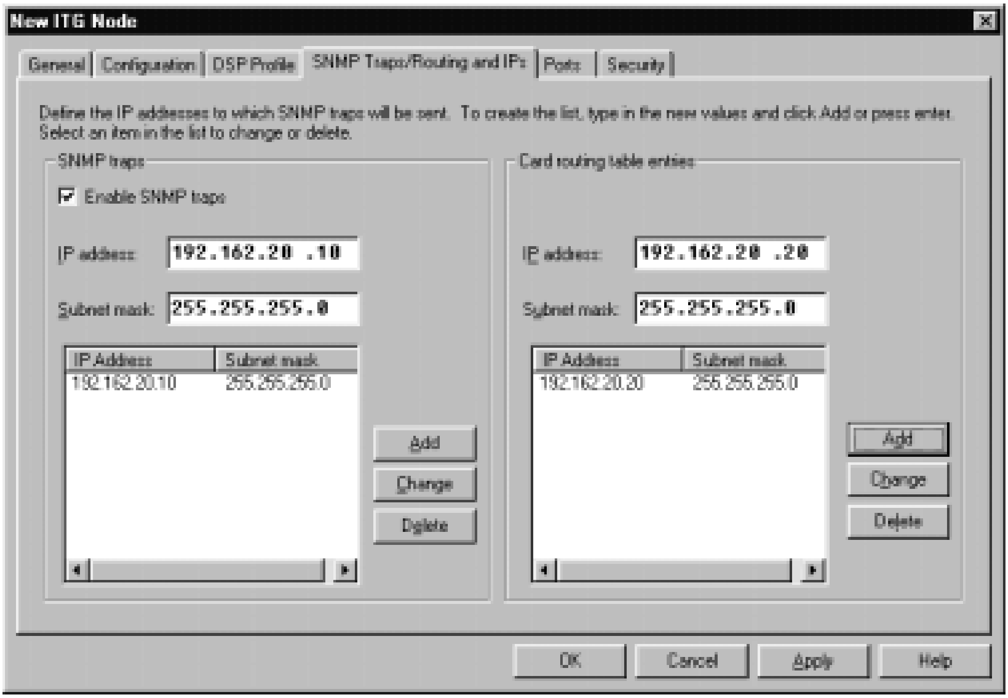
Note: A net route or host route through the management gateway is added to the ITG line cards IP Routing Table for each SNMP management address that is added to the SNMP traps list.

4 To add a net route or host route through the ELAN router management gateway for a management host which does not receive SNMP traps, type the IP address and subnet mask in the entry field of the card routing table, and click **Add.**

5 Click **OK** to save and exit.

——————— ***End of Procedure*** ———————

Figure 22
SNMP traps/Routing and IPs tab



Configure security for SNMP access

This procedure explains how to change the SNMP community names to provide better security for the ITG node. MAT/OTM uses the community name password to refresh the ITG line card status, and to control the transmitting and retrieving of configuration data files for database synchronization.

> ***Note:*** If you forget the community names, connect a TTY to the ITG card maintenance port. Restart the card. The card displays the community name on the TTY during startup.

Procedure 10
Configuring security for MAT SNMP access

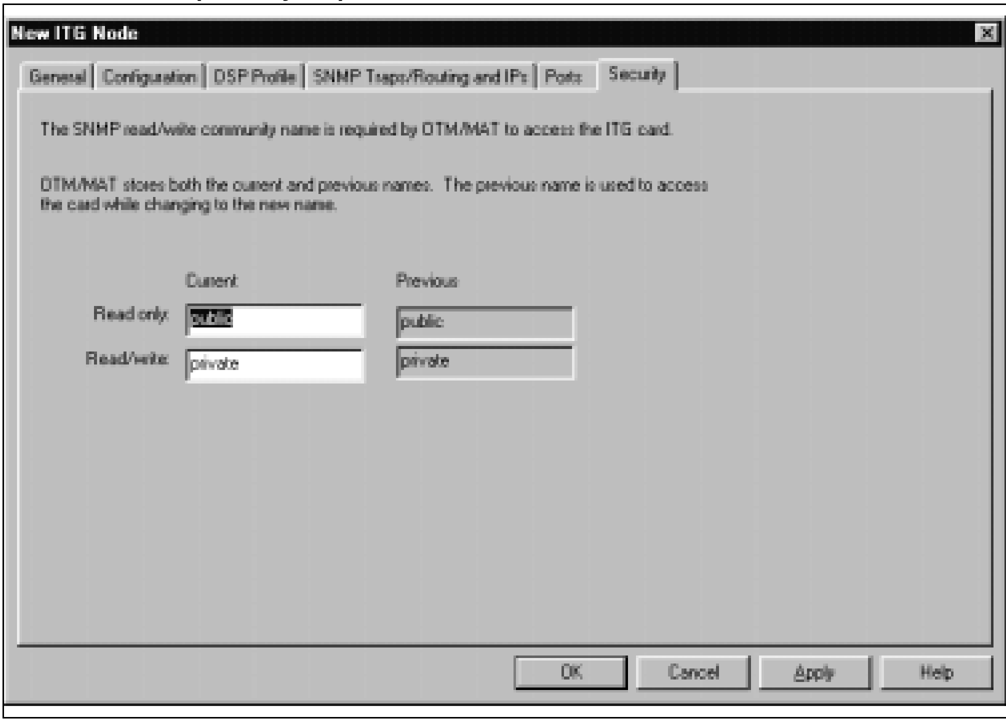
1 Click the **Security** tab (see Figure 23 on page 141).

2 Change the default Read only and Read/Write default community names. MAT/OTM uses the previous read/write community name to transmit the card properties. The first time you transmit data after changing the password, the Previous read/write password is used. For all following data transmissions, the changed password is used.

3 Press **Apply**.

End of Procedure

Figure 23
New ITG Node (Security tab)



Configure alarm notification features in MAT

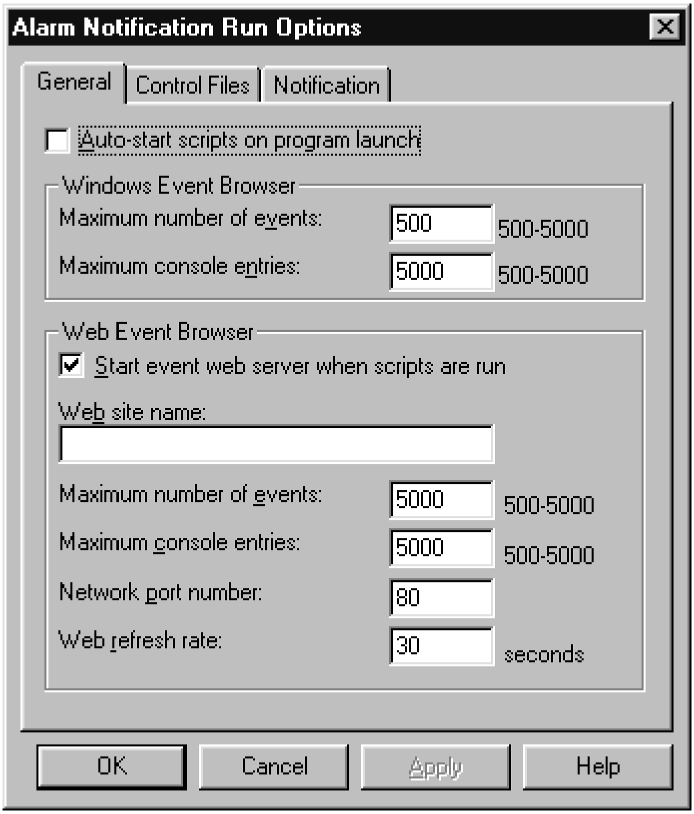
Procedure 11
Configuring MAT/OTM alarm notification feature

1 In the MAT/OTM Navigator window menu, select **Utilities | Alarm | Notification**.

2 Select **Configuration | Run Options**.

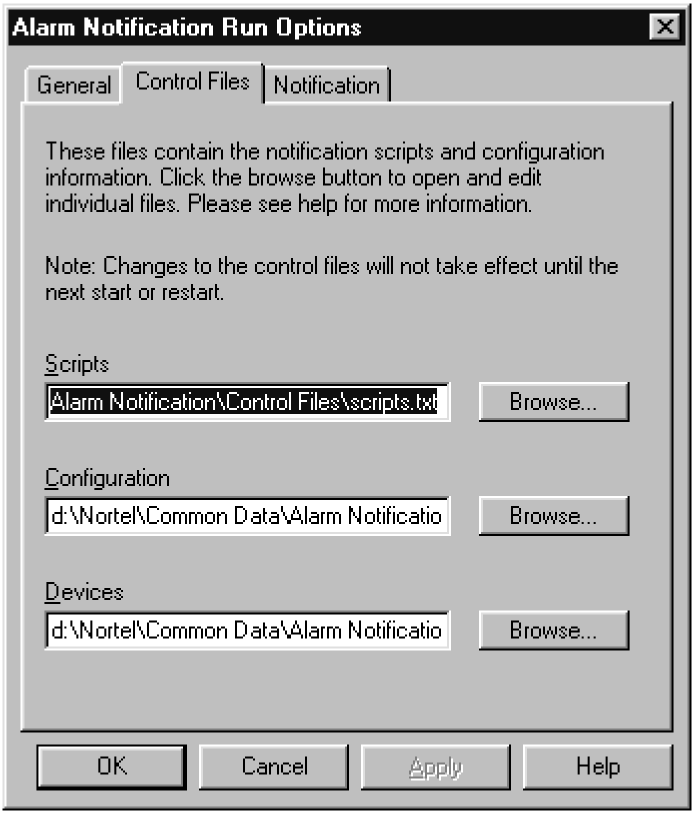
The "Alarm Notification Run Options" dialog box appears (see Figure 24 on page 142).

Figure 24
Alarm Notification Run Options (General tab)



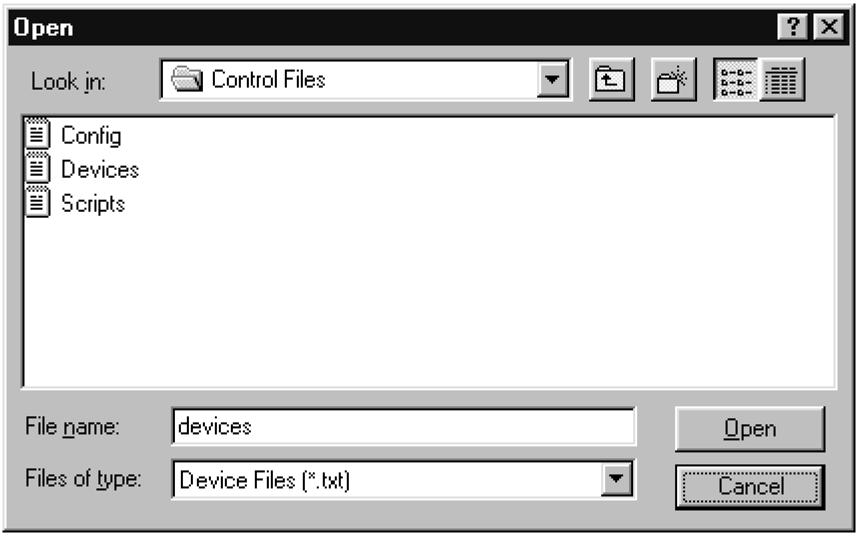
3 Click the Control Files tab. (See Figure 26 on page 144.)

Figure 25
Alarm Notification Run Options (Control Files tab)



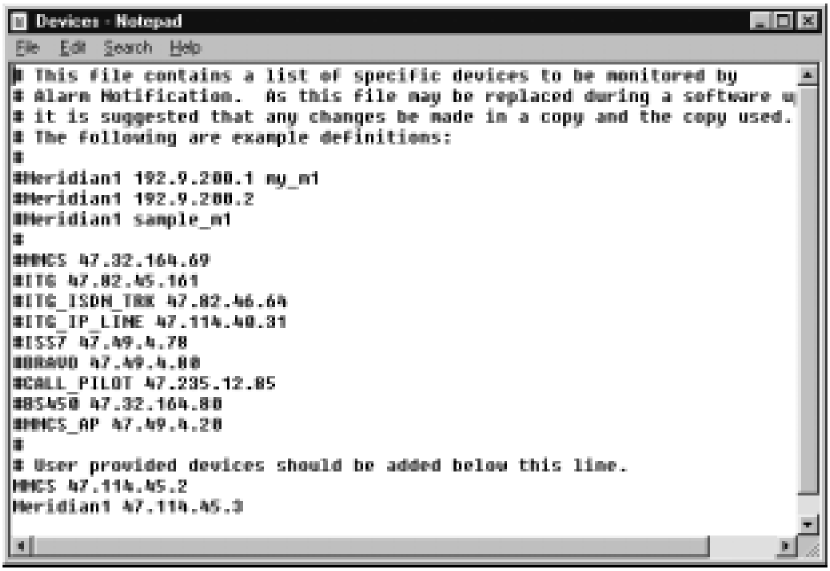
4 Click **Devices | Browse**. The "Open" dialog box appears.

Figure 26
Open dialog box (Devices)



5 Select the "Devices.txt" file from the "Control Files" folder and click **Open**. The "Devices.txt" file opens.

Figure 27
Devices.txt Notepad



6 For each ITG Line 2.1 card in each monitored ITG Line 2.1 card node, add a line consisting of three fields separated by spaces, as shown in Table 22. Enter the first line in the Devices.txt file that begins with a "#" sign.

Table 22
Format of Devices.txt file

Device Type	IP Address	Device Name
ITG_IP_PHONES	xxx.xxx.xxx.xxx	Site_Leader_0
ITG_IP_PHONES	xxx.xxx.xxx.xxx	Site_Leader_1
ITG_IP_PHONES	xxx.xxx.xxx.xxx	Site_Follower_2

7 Click **File|Save** As and save as **ITGDevices.txt**.

8 In the "Alarm Notification Run Options" window, verify that the devices field name is correct ("ITGDevices.txt")

9 Click **Apply** then **OK**.

Note: MAT/OTM Alarm Notification must be restarted whenever Control Files are changed.

10 If MAT/OTM Alarm Notification is running, that is, the red traffic light is showing on the tool bar, first stop it by clicking on the red traffic light which then changes to green on the tool bar. Restart it by clicking on the green traffic light which then changes to red.

11 If MAT/OTM Alarm Notification is not running, that is, the green traffic light showing on the tool bar, start it by clicking on the green traffic light which then changes to red.

——— ***End of Procedure*** ———

Transmit ITG Line 2.1 node configuration data from MAT to the ITG Line 2.1 cards

Before you begin:

- the NTVQ55AA ITG Line 2.1 cards and cables have been installed.
- the ELAN and TLAN interfaces of all ITG Line 2.1 cards are connected with access to the IP network.
- the Meridian 1 system is configured to support Internet Telephones and the ITG physical TNs (IPTNs).
- the ITG Line 2.1 data has been configured on MAT.
- the MAT PC is connected to the local ELAN subnet or to a remote subnet with IP router access to the ELAN and TLAN.

Overview

ITG Line 2.1 node and card properties are configured in the MAT ITG IP Phones application and then transmitted to the ITG line cards. The configuration data is converted to text files by MAT and transmitted to the line cards. The process consists of the following steps:

- Set the Leader 0 IP address from TTY connected to local RS232 maintenance port
- Reboot Leader 0
- Transmit the node and card properties from MAT ITG IP Phones application to Leader 0
- Reboot Leader 0
- Transmit card properties to all cards in the node

Procedure 12
Set the Leader 0 IP address

1 Access the ITGL shell by connecting the COM port of a MAT PC to the RS232 serial maintenance port on the faceplate of the ITG Leader 0 card with an NTAG81CA PC Maintenance cable. If required, use an NTAG81BA Maintenance Extender cable between the PC Maintenance cable and the MAT PC.

Alternatively, connect the NTAG81BA Maintenance Extender cable to the female DB -9 connector of the NTMF94EA E-LAN, T-LAN RS232 Ports cable for a more permanent connection to the ITG card serial maintenance port.

Note: Never connect two terminals to the faceplate and I/O panel breakout cable serial maintenance port connectors at the same time.

2 Use the following communication parameters for the TTY terminal emulation on the ITG MAT PC: 9600 baud, 8 bits, no parity, one stop bit.

3 Login to the ITGL shell and enter the command **setLeader** to set the Leader 0 Management LAN IP address, Management LAN gateway IP address and the Management LAN subnet mask.

4 Observe the Leader 0 card faceplate maintenance display window:

When the display reads "T:20", it begins to send bootp requests on the E-LAN. A series of dots is printed on the TTY.

5 Type **+++** to escape from the bootp request and receive the login prompt**.....+++**

6 At the VxWorks login prompt, enter the default "user ID" and "password" of itgadmin to access the ITGL shell command line prompt:

...+++

VxWorks login: itgadmin

password: itgadmin

7 When the maintenance window displays "T:21", at the ITGL shell prompt, enter:

a. ITGL> **setLeader “xx.xx.xx.xx”,“yy.yy.yy.yy”,”zz.zz.zz.zz”,**

Note 1: The three parameters must each be enclosed in double quotes. You must put a space after the command, and before the first parameter, and a comma and no spaces between the following parameters.

where:

b. “xx.xx.xx.xx”=IP address. Enter the same IP address you entered in the **Management LAN IP** field for **Leader 0** in the **ITG IP Phones Node Properties Configuration** tab.

c. "yy.yy.yy.yy"=Gateway IP address. Enter the same address you entered in the **Management LAN gateway IP** field in the **ITG IP Phones General** tab. If there is none, enter: "**0.0.0.0**"

d. "zz.zz.zz.zz"=Management LAN subnet mask. Enter the same address you entered in the **Management LAN subnet mask** in the **ITG IP Phones General** tab.

Note 2: This step assumes you have already configured the new ITG Line 2.1 node in MAT.

8 Reboot Leader 0 ITG Line 2.1 card. At the ITGL prompt, enter: **cardReset**, or press the reset button on the faceplate of the Leader 0 ITG Line 2.1 card.

9 Check the maintenance display for T:22 to confirm a successful reboot.

10 From the MAT ITG IP Phone application select **Refresh view** to show the card status. Otherwise, verify LAN connections and IP configuration.

End of Procedure

Procedure 13
Transmit node and card properties to Leader 0

1 Log into Overlay 32 in Meridian 1. Disable the card in order to transmit the card properties.

2 Open MAT/OTM. From the **MAT Navigator** window, click **Services** to expand the menu.

3 Double-click on **ITG IP Phones.** The **IP Telephony Gateway - IP Phones** window opens.

4 Select the ITG line node to which you want to transmit configuration data from the list of ITG Line 2.1 nodes in the upper part of the window.

5 Click **Configuration** | **Synchronize** | **Transmit.** The “ITG - Transmit Options” window appears (see Figure 28).

6 Leave the radio button default setting of “**Transmit to selected nodes**”. Check the “**Node Properties and Card Properties**” check boxes.

7 Click the **Start Transmit** button. Monitor progress in the “Transmit Control” window. Confirm that the node and card properties are transmitted successfully to Leader 0.

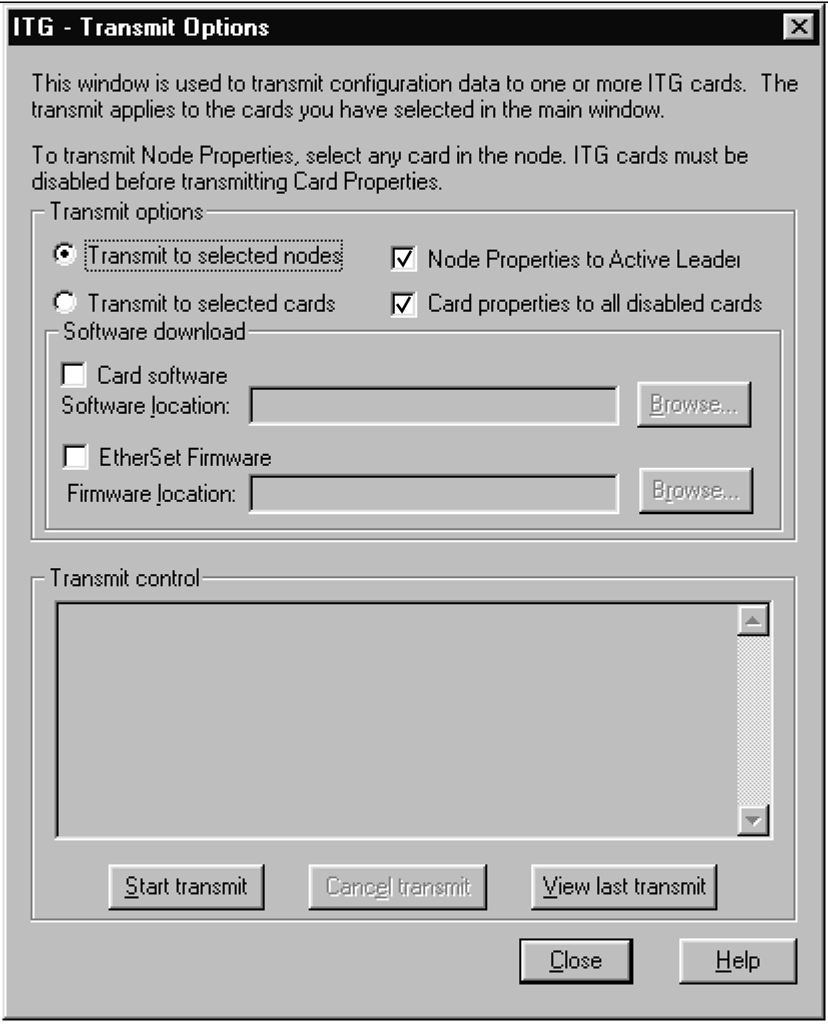
Note: It is normal at this point, that the card properties fail to transmit to the other cards in the node, because they have not yet received the IP address from Leader 0 bootp server.

8 When the transmission is complete, click the **Close** button.

9 Reboot the Leader 0 ITG Line 2.1 card. At the ITGL prompt, enter: **cardReset** or push the reset button on the ITG line card faceplate.

End of Procedure

Figure 28
ITG Transmit Options dialog box



Procedure 14
Transmit card properties to all cards in the node

To verify installation and configuration:

1 Check card faceplate displays.

— After successfully rebooting, the Leader 0 card is now fully configured with the Node Properties of the node and enters a state of “active leader”. The Card faceplate display shows **Lxxx,** where xxx = the number of i2004 sets registered with the terminal proxy server on the Leader card. L000 shows no i2004 Internet Telephones are registered.

— The Leader 1 card, in MAT, and any follower cards receive their configuration from the Leader 0 card. The faceplate display shows **Fxxx,** where xxx = the number of i2004 sets registered with the terminal proxy server on the Leader card. F000 shows no i2004 Internet Telephones are registered.

2 Select the new ITG node from the list in the upper part of the main window. All ITG cards in the node are displayed in the lower part of the window. While the node is selected, from the node list, press function key **F5** or **View | Refresh | Selection** to refresh the card status of all cards in the selected node. The card status changes from "unknown" or "not responding" to "disabled", "enabled, and unequipped".

Note: If you cannot communicate with Leader 1 and followers in the node after transmitting the node properties and rebooting the Leader 0 card, this means that the ITG cards are unable to communicate back to the remote MAT/OTM ITG PC through the voice gateway or TLAN router.

To establish communication with Leader 1 or other follower cards, the ITG node:

a. verify the T-LAN physical and logical connections on all the non-responsive cards. Check:

i. cables plugged securely into the correct TLAN connection

ii. hub or switch is connected to correct TLAN router

iii. remote MAT or OTM can communicate with TLAN router

b. If remote MAT/OTM cannot communicate via TLAN router, connect to the ITG line card maintenance port and use the ITGL shell ’routeAdd’ command on each ITG line card to add a new IP route, via the management gateway, that points to the remote MAT/OTM ITG PC subnet.

c. If the card is reset before MAT/OTM successfully transmits the card properties (containing the SNMP Manager IP addresses and the card routing IP addresses) then you must repeat step b.

3 If any of the cards are not status "disabled", go into Overlay 32 and disable the card in order to prepare to transmit card properties again to Leader 1 and follower cards.

4 When Leader 1 and follower cards all show a status of disabled, go into **Configure | Synchronize | Transmit.** When the Transmit window opens, click the radio button "**Transmit to selected nodes**" and click option to transmit the card properties.

5 Click "**Start Transmit**". Carefully monitor the progress carefully to verify that the card properties are successfully transmitted to every ITG line card in the selected node identified by its TN.

6 Verify that all ITG Line 2.1 cards in the node have established a signalling link to the Meridian 1 Call Server.

End of Procedure

Upgrade the ITG Line 2.1 card software and i2004 set firmware

Before upgrading your software and firmware, check which version of card software and i2004 set firmware is currently installed. Compare this to the latest versions available by accessing the Meridian 1 Electronic Software Documentation (ESD) website. Refer to Procedure 15 on page 153 for complete instructions.

If a software upgrade is required, the preferred method of software delivery is directly from the Meridian 1 ESD website. Alternatively, when Internet access is restricted or unavailable from the MAT/OTM PC, the latest software can be ordered on CD ROM and inserted into the CD ROM drive on the MAT/OTM PC.

Procedure 15
Verify card software and i2004 Internet Telephone firmware

1 In the ITG IP Telephone main window, select an ITG Line 2.1 node. A list of all line cards for that node appears in the lower part of the window.

2 Starting with the Leader 0 ITG Line 2.1 card, double-click each ITG Line 2.1 card in the list, to open the IP Telephony Gateway Line 2.0 card Properties window.

3 Leave the default selection of the ITG Line 2.1 card in the Card Properties window, and click the "Configuration" tab. The current ITG Line 2.1 card software and i2004 firmware versions are displayed on this tab.

4 Write down the ITG Line 2.1 card software and i2004 Internet telephone firmware release of each ITG Line 2.1 card for comparison against the latest recommended software release.

5 Check the Meridian 1 ESD website for the latest software and firmware releases available:

a. Open a web browser on the MAT PC and connect to the following URL:
"**http://www.nortelnetworks.com/servsup/esd/meridian1/**".

b. Click on the **Login now** link.

c. Click **OK**, repeatedly, to advance through authentication screens.

d. At the login screen, enter your Username and Network password.

e. If you are not registered with the Meridian 1 ESD website, refer to the generic Release 25 product bulletin for directions on how to register.

f. When the Meridian 1 Distribution System screen appears, click on the **IP Telephony** link.

g. From the Meridian 1 IP Telephony pull-down menu, select **IP_Telephones**.

h. A table labeled "**ITG Line-side 2.0 - Internet Telephone**" appears. The File Name column contains a zipped file with the latest software version imbedded in its filename.

i. Click on the pdf file in the Documentation column to download the text file associated with the latest card software.

j. Open the "**readme.txt**" file, that contains the version number of the latest card software and associated i2004 firmware.

6 Compare the latest software and firmware versions available, with the software and firmware version of the CD ROM shipped with the ITG Line 2.1/i2004 Internet Telephone.

7 If the CD ROM is **not up-to-date**, upgrade the ITG Line 2.1 card(s) with the software and firmware files downloaded from the ESD website.

Refer to Procedure 16, "Upgrade ITG Line card software from the web" on page 154, and Procedure 17, "Upgrade i2004 Internet Telephone firmware" on page 157 for complete instructions.

8 If the CD ROM software and firmware **is up-to-date, do not** upgrade your ITG Line 2.1 cards from the web. Install the software and firmware from the CD ROM onto the ITG Line 2.1 card/i2004 Internet Telephone when prompted by MAT/OTM.

End of Procedure

Procedure 16
Upgrade ITG Line card software from the web

1 If you just completed Procedure 15, and downloaded the latest software and firmware files, skip to step 5. Otherwise, from the MAT/OTM PC open a web browser and connect to the following URL address:

http://www.nortelnetworks.com/servsup/esd/meridian1/

2 When you are connected to the site, enter the username and password.

Note: If you are not registered with the Meridian 1 ESD website, refer to the generic Release 25 product bulletin for directions on how to register.

3 Select the latest recommended software version files and the location on the MAT/OTM PC hard drive to where it is to be downloaded. Record the MAT/OTM PC hard drive location for use later in the procedure.

4 Download and unzip the software file. Use the **swDownload** command.

5 Open MAT/OTM and launch the "**ITG IP Phones**" application, if it is not already open.

6 Select the ITG cards from the main card list view that are to be upgraded. Upgrade all the cards in the node together, unless you are installing a spare card that has older software.

7 Disable all ITG Line 2.1 cards to be upgraded. Use the Meridian 1 Overlay 32 DISI command from MAT/OTM Maintenance Windows, the MAT/OTM System Passthru terminal, or from a Meridian 1 system management terminal directly connected to a TTY port on the Meridian 1.

8 In the MAT/OTM "**IP Telephony Gateway - IP Phone**" main window, select **View | Refresh** and verify that the card status is showing "Disabled."

9 Select **Configuration | Synchronize | Transmit**. The "**ITG - Transmit Options**" dialog box is displayed.

10 In the "**Transmit Options**" group box, select the radio button "Transmit to selected cards."

11 In the "**Software Download**" group box check "**Card software**".

12 Click on the **Browse** button to locate the ITG Line 2.1 card software that was downloaded earlier from the website. Select the software file and click **Open** to save the selection. The path and file name of the ITG Line 2.1 card software appears in the edit box next to the "Browse" button.

13 Click on the **Start Transmit** button to begin the ITG Line 2.1 card software upgrade process.

The software is transmitted to each card in turn, and burned into the flash ROM on the ITG Line 2.1 card.

14 Monitor progress in the "**Transmit Control**" window. Confirm that the card software is transmitted successfully to all cards. Note any error messages, investigate, correct any problems, and repeat card software transmission until it is completed successfully on each ITG Line 2.1 card. The cards continue to run the old software until they are rebooted.

15 Reboot each ITG Line 2.1 card that received transmitted software, so that the new software can take effect. Start the rebooting with Leader 0, followed by the other cards.

16 After all ITG Line 2.1 cards have been reset, have successfully rebooted, and are responding again to the MAT/OTM ITG, do a **Status refresh** (disabled: active; disabled: backup; disabled).

Note: These cards must remain in the “Disabled” state after the upgrade, so that the technician can issue a “Reset” command from the Maintenance menu, or the “Maintenance” tab, in the “IP Telephony Gateway Line 2.0 card Properties” window to each card, to reboot them. Alternatively, the cards can be reset by using a pointed object to press the “Reset” button on the card faceplate.

17 Double-click each upgraded card and verify the software version on the “**Configuration**” tab of the Card Properties.

18 Use the Overlay 32 ENLC command to re-enable the ITG Line 2.1 cards.

— Use LD 32 via the TTY or MAT/OTM overlay passthru to enable the ITG Line 2.1 cards with one of the following commands:

- ENLC l s c. (for Meridian/Succession CSE 1000)
- ENLC c (for Option 11C or 11C mini)

19 Repeat the above steps for each ITG Line 2.1 card.

——————— ***End of Procedure*** ———————

Procedure 17
Upgrade i2004 Internet Telephone firmware

1 If you have just completed Procedure 15 and Procedure 16, skip to step 4. Otherwise, open a browser on the MAT/OTM PC and connect to the following URL address:

http://www.nortelnetworks.com/servsup/esd/meridian1/

2 When you are connected to the site, enter the username and password.

Note: If you are not registered with the Meridian 1 ESD website, refer to the generic Release 25 product bulletin for directions on how to register.

3 Select and download the latest recommended firmware version zip file into the location on the MAT/OTM PC hard drive where it will be unzipped. Record the MAT/OTM PC hard drive location for use later in the procedure.

Note: The latest i2004 Internet telephone firmware is contained in zipped files with the latest cad software.

4 Open MAT/OTM and launch the "**ITG IP Phones**" application, if not already opened.

5 Select the ITG cards, for upgrading, from the main card list view. All cards must have the same firmware version.

6 Verify that all ITG Line cards that requires a firmware upgrade have established a signalling link with the Meridian 1 call server.

Note: You do **not** need to disable the cards to update the firmware.

7 Select **Configuration | Synchronize | Transmit**. The "ITG - Transmit Options" dialog box is displayed.

8 In the "Transmit Options" group box, select the radio button "Transmit to selected node".

9 In the "**Software Download**" group box check "**Etherset Firmware**."

10 Click on the **Browse** button to locate the ITG Line 2.1 card firmware that was downloaded from the Meridian 1 ESD website. Select the firmware file and click **Open**. The path and file name of the ITG Line 2.1 card firmware appears in the firmware file location edit box next to the "Browse" button.

11 Click on the **Start Transmit** button to begin the ITG Line 2.1 card firmware upgrade process.

The firmware is copied to the C:\ drive of the MAT PC.

12 The i2004 Internet Telephones continue to run the old firmware until the **umsUpgradeAll** command is executed or the i2004 Internet Telephone re-registers with the ITG Line 2.1 card that contains the new firmware.

13 Verify the time and the date on each ITG card before proceeding to the next step.

14 Telnet into each ITG Line 2.1 card at the ITG line command, and enter:

umsUgradeAll "hh:mma/p"

where hh:mma/p specifies the time when the upgrade will occur.

At the specified time, all the i2004 Internet Telephones on the ITG node go out of service. This may take several minutes. Upon completion of the firmware upgrade, the i2004 Internet telephones are brought back on-line in groups of ten.

CAUTION

Without the"hh:mma/p" parameter, the umsUgradeALL command will cause the i2004 Internet Telephones to be taken out of service immediately.

15 For each ITG Line 2.1 card, at the ITGL prompt, enter:

isetShow

to verify the upgraded i2004 Internet Telephones.

16 For any i2004 Internet telephones which did not upgrade successfully, try one of the following:

- power on and off the set
- use the **isetReset** command
- enter the following combination of key strokes at the set console: **mute, up, down, up, down, up, mute, 9, release.**

End of Procedure

ITG MAT 6.67.07 (with update disk and loss plan patch)/OTM 1.0 setup on PC

Contents

This section contains information on the following topics:

Overview

This section provides guidelines on how to set up Meridian Application Tools (MAT) 6.67.07 (with update disk and loss plan patch) and Optivity Telephone Management (OTM) 1.0 to support the Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 card and i2004 Internet Telephone. The MAT 6.67.07(with update disk and loss plan patch)/OTM 1.0 application name is **ITG IP Phones**.

> ***Note:*** For the remainder of this chapter, MAT 6.67.07(with update disk and loss plan patch)/OTM 1.0 is referred to as MAT/OTM.

ITG Engineering rules

MAT/OTM ITG can manage multiple nodes with multiple ITG Line 2.1 cards. The maximum number of ITG Line 2.1 cards that can be configured depend on the following:

1 All MAT/OTM ITG data is stored in a single database file. The entire database is read into PC memory when you launch the program. If a large ITG network is to be managed from a single MAT/OTM server, then each client must have more than 32 Mb RAM. If the data is stored on a MAT/OTM server, the application launch time increases as the size of the ITG network grows (this also depends on the network speed).

2 In theory, a single MAT/OTM installation can support up to 500 Meridian/Succession CSE 1000. However, MAT 6.6/OTM applications that require real time, such as Traffic Analysis retrieval of traffic data, are limited to a much smaller number of systems.

3 MAT/OTM Alarm Notification can receive a maximum of 20 SNMP traps per second (based on the recommended PC configuration). In large networks, it is recommended that multiple MAT/OTM PCs be used to collect traps from ITG cards, each PC supporting one or more ITG nodes. Alarm notification scripts can be used to forward critical alarms to a central MAT/OTMMAT/OTM PC or Network Management application.

Network setup guidelines

Install MAT/OTM in a standalone mode or in a network environment. For ITG Line 2.1, install MAT/OTM in a network environment, so you can manage multiple ITG nodes, provide multi-user access, and maintain ITG configuration data consistency.

In the network environment, MAT/OTM stores databases on a file server. Do not use the server to access MAT/OTM as a client PC. MAT/OTM with Windows 95 or Windows NT 4.0 clients are supported on:

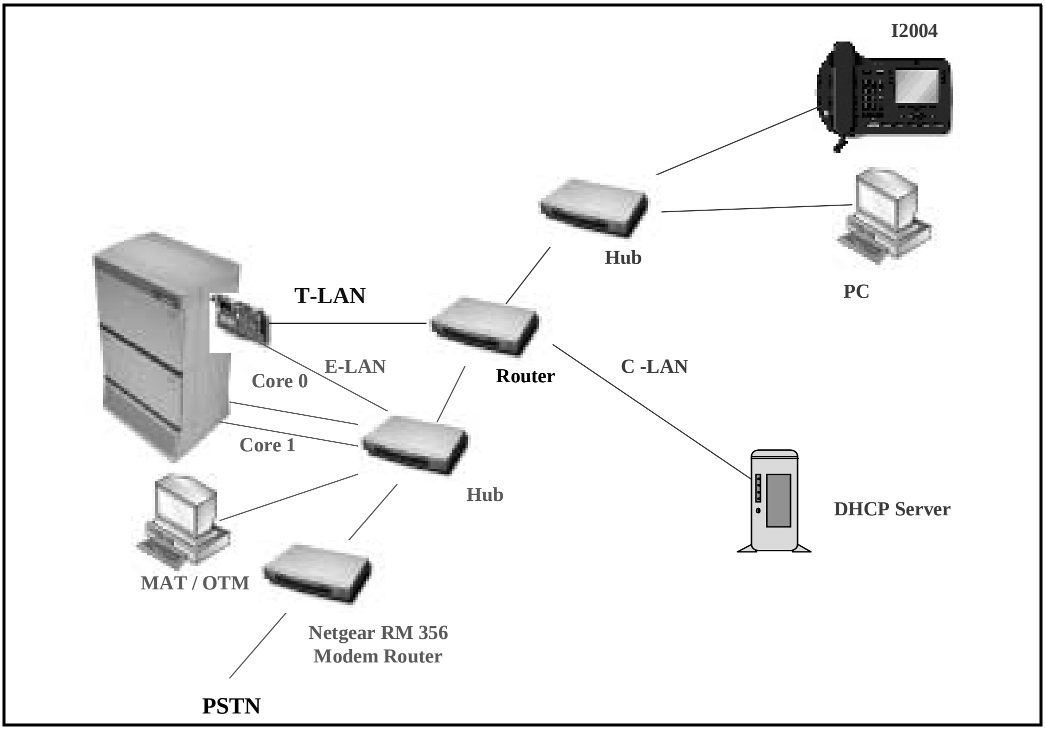
- Novell 3.12 or later server
- Windows NT server
- OTM 1.0 client requires an OTM server

Remote Access configuration

Support for remote access varies according to the support organizations access to the customer's data network LAN or WAN. There are three possible remote access scenarios. Refer to Figure 29 on page 161 for an illustration of remote access configuration.

- Customer provides an authenticated RAS account to all E-LANs and router interfaces for full access to the customer's network.
- Install dial-up modem routers on the E-LANS and configure access to the customer's T-LAN in a secure manner.
- Connect an ordinary modem to the ITG Line 2.1 card serial port for limited access to the ITG Line 2.1 card configuration using Advanced Methods (not MAT). This provides a read-only solution.

Figure 29
Remote access with full access to the customer's LAN/WAN



PC description

The MAT/OTM PC can be attached to a LAN to provide multi-user, multi-site access. The MAT/OTM applications and database must reside on a LAN Server with each client accessing the files from the server.

> ***Note:*** The server used for MAT/OTM is used as a file server only and must not be used to access MAT/OTM as a client PC.

A single network drive location is chosen during the MAT/OTM client PC installation process. For multi-system configurations where large data store requirements exceed the capacity of a single drive, or where data integrity is highly valued, a Redundant Array of Inexpensive Disks (RAID) storage solution is recommended. Tape, or other types of backup, is recommended.

When you install MAT/OTM client applications, it is important for the network drive to be mapped the same way from each PC if a MAT/OTM user is expected to be able to log into the network with their network login ID at any MAT/OTM client PC.

A PC security device is required for every PC running MAT/OTM. A security device is not required for the PC server as it is only used to store MAT/OTM data and does not actually run any MAT/OTM applications.

Each of the MAT/OTM client PCs on the customer LAN is allowed connectivity to IP addresses of the Meridian/Succession CSE 1000:

1 MAT/OTM client PC in a switchroom (on the E-LAN subnet) has access to the File Server on the customer network.

2 Block broadcast messages from the C-LAN to the E-LAN.

3 Block access to the E-LAN from non-MAT/OTM client PCs for security reasons.

PC hardware and software requirements

The list below is the minimum PC hardware and software requirements to run MAT/OTM. Other applications launched while you use MAT/OTM can require increased RAM:

- A Pentium Processor PC with:
  - 100 MHz or faster CPU

  — One GB or larger hard disk drive with 500 MB or more free space (includes Windows 95/NT 4.0 requirements). Please refer to system datastore column in the hard drive requirements chart that follows:

- 32 MB RAM (minimum)
- SVGA color monitor and interface card (800x600 resolution for graphics)
- 3-1/2 inch 1.44 MB floppy disk drive
- Windows 95 or Windows NT 4.0 with Microsoft TCP/IP installed
- Ethernet Network Interface Card
- Hayes-compatible modem is optional to connect to remote systems, required for polling configurations (9600 bps or better is recommended)
- PC COM port with 16550 UART
- Parallel printer port. Configure a printer even through it is not required to be attached to the PC.
- Two-button Windows compatible mouse or positioning device
- CD-ROM drive

Hard drive requirements

For a single MAT/OTM PC configuration, refer to Table 23 to select the hard drive space required on the MAT/OTM PC. Consider both program and data store requirements.

For MAT/OTM client configurations (two or more MAT/OTM PCs sharing the same database), the common data is stored on a server PC that does not run MAT/OTM. Estimate the size of the required disk space on this server using the Data Store column in Table 23.

Table 23
Hard drive capacity for MAT/OTM applications

MAT/OTM application	Program store	Data store
Common services (required)	38 MB	Negligible.
ITG IP Phones	1.5 MB	1.0 MB plus 0.5 MB per 1k ITG cards
Traffic Analysis	5 MB	Meridian/Succession CSE 1000 dependent: Typically 2.5 to 9 MB per month for each system traffic data.
ESN	1 MB	Meridian/Succession CSE 1000 dependent: Allow 1 MB per customer.
Maintenance Windows	1 MB	Negligible.
Alarm Management with Alarm Notification	1.5 MB	Negligible.

Installation and maintenance of i2004 Internet Telephone

Contents

This section contains information on the following topics:

Overview

This chapter explains how to install the i2004 Internet Telephone and how to perform some maintenance tasks.

The following procedures are contained within this chapter:

- Procedure 18, “Pre-installation checklist” on page 166.
- Procedure 19, “Manual first-time installation of the i2004 Internet Telephone” on page 167.

- Procedure 20, “Automatic first-time installation of the i2004 Internet Telephone” on page 171.
- Procedure 21, “Changing the TN of an existing i2004 Internet Telephone” on page 172.
- Procedure 22, “Replacing an i2004 Internet Telephone” on page 172.
- Procedure 23, “Taking an i2004 Internet telephone out of service” on page 172

Before you begin

Procedure 18
Pre-installation checklist

1 Make sure you have one NTEX00BA i2004 Internet Telephone Boxed Package for each i2004 Internet Telephone. The Boxed Package contains:

- NTEX00AA i2004 Internet Telephone
- A0648375 7 foot Ethernet cable, Category 5
- PO910803 i2004 Quick Reference Card
- A0619627 Power Transformer (117/120 Vac 50/60 Hz)
- A0788874 Telephone Handset (Ethergray)
- A0788682 Telephone Handset Cord (Ethergray)
- P0886045 Telephone footstand

2 Make sure you have the following:

- A dedicated 10BaseT or 100BaseT or 10/100BaseT Ethernet interface.
- A small desktop hub or switch if you are sharing your existing desktop Ethernet connection with your PC.
- A local power supply appropriate for the voltage in your area.

3 You must be familiar with the three configuration modes that you will be prompted to choose from as you proceed through the installation of your i2004 Internet Telephone:

- Partial DHCP mode: works with standard DHCP server
- Full DHCP mode: requires special configuration of the DHCP server to recognize the i2004 Internet Telephone
- Manually configured static IP address: available IP address for static assignment of i2004 Internet Telephone. Your IP Network Administrator provides this address.

Note 1: If you chose Partial or Manual configuration mode, you have to configure connect service parameters.

Note 2: The IP address for connect servers 1 and 2, Node ID and VTN must be provided by the Meridian/Succession Communication Server for Enterprise (CSE) 1000 System Administrator.

Note 3: Refer to “Configuration of the DHCP server” on page 97, and Appendix F: “DHCP Supplementary Information” on page 283, for further information.

End of Procedure

Manual first-time i2004 Internet Telephone installation

To install and configure an i2004 Internet Telephone, you must first install an ITG Line 2.1 card on the Meridian/Succession CSE 1000 host. The i2004 Internet Telephone application must be running on the card.

Procedure 19
Manual first-time installation of the i2004 Internet Telephone

1 Configure a virtual loop on the Meridian/Succession CSE 1000 1 using LD 97.

2 Configure the i2004 Internet Telephone on Meridian/Succession CSE 1000 using LD 11.

3 Connect the i2004 Internet Telephone components:

a Connect one end of the handset cord to the handset jack on the back of the telephone identified with a handset icon.

b Connect the other end of the handset cord to the handset.

c Connect one end of the CAT-5 line cable to the Ethernet jack on the back of the telephone. The other end plugs into the IP voice network (Ethernet), using a RJ45 connector.

CAUTION

Do not plug your i2004 Internet Telephone into an ISDN connection. Severe damage can result. Consult your system administrator to ensure that you are plugging your set into a 10/100BaseT Ethernet jack.

d Plug the AC Power adapter into the connection on the back of the telephone. Be sure to thread the cord around the strain relief, retaining hook, and channel provided for a secure power connection.

e Plug the AC power adapter into the nearest power outlet. Check your i2004 Internet Telephone User Guide for country-specific parameters.

4 Secure the telephone footstand to the base of the telephone. Use the angle adjustment grip on the top back of the telephone to adjust the position.

IMPORTANT

Before plugging in your i2004 Internet Telephone, read the following important timing information:

There are only **four seconds** between plugging in the i2004's power transformer and the appearance of the Nortel Networks logo on the display. When you see the logo, you have **one second** to respond by pressing the four feature keys at the bottom of the display in sequence from left to right. If you miss the one second response time, the i2004 will start trying to locate the connect server. You will have to wait until it is finished, and then begin the power up sequence again.

5 Power-up the i2004 Internet Telephone.

6 When the Nortel Networks logo appears on the display, immediately press the four feature keys at the bottom of the display in sequence from left to right.

7 At the prompt "DHCP Yes/No?", enter "**No'** for manual configuration.

8 Enter a valid i2004 Internet Telephone IP address, subnet mask, and router IP address (Gateway) for the i2004 Internet Telephone on the LAN segment to which it is connected.

9 Enter the Node IP address of the ITG i2004 Line node at the S1 IP prompt. Continue entering the following information for the S1 server:

- S1 Port: 4100
- S1 Action: 1
- S1 retry count: 10

10 You are now prompted for S2 information. Enter the same IP address, port number, action and retry count as for connect server 1 (above).

11 The i2004 Internet telephone searches for the connect server. When the connection is complete, enter the Node ID and the TN or VTN.

12 The i2004 Internet Telephone begins the firmware download. This takes several minutes. When complete, the i2004 Internet Telephone resets itself.

13 You are now prompted for the DHCP mode: 0 - Full, 1 - Partial:

Note: Partial DHCP mode does not require any special configuration of the DHCP server. Full DHCP mode requires special configuration of the DHCP server to recognize the i2004 Internet Telephone.

14 The Meridian/Succession CSE 1000 logo, date and time appears on the top line of the display when the manual configuration is complete.

15 Check for dial tone and the correct DN above the display. Manual configuration is complete.

End of Procedure

Automatic first-time installation of an i2004 Internet Telephone

Automatic configuration of the i2004 Internet Telephone client requires an i2004 Internet Telephone-aware DHCP server. DHCP allows the dynamic allocation of IP addresses to different clients.

The Nortel Networks i2004 Internet Telephone can act as a DHCP client. As part of the startup routine, the i2004 Internet Telephone can request automatic network and local configuration parameters from a DHCP server. The DHCP server responds to the request and supplies information.

Network configuration parameter requests include:

- IP address of the i2004 Internet Telephone
- Subnet mask for the i2004 Internet Telephone IP address
- Default gateway for the i2004 Internet Telephone LAN segment

Local configuration parameter requests include:

- A command (UNIStim Hello)
- IP address of the ITG Line 2.1 node Active Leader. The ITG Line 2.1 card acts as a bootstrap server to download the most recent version of the i2004 Internet Telephone firmware, if required. The Active Leader gives the IP address of the Terminal Proxy Server (TPS) through which the i2004 Internet Telephone registers with the Meridian/Succession CSE 1000.
- Number of retries for the primary and secondary bootstrap server.

To install and configure an i2004 Internet Telephone, the host Meridian/Succession CSE 1000 must be installed with the ITG Line 2.1 cards, and the ITG Line 2.1 cards must be running the i2004 Internet Telephone application. A DHCP server and DHCP relay agents, if necessary, must also have been installed, configured and running.

Procedure 20
Automatic first-time installation of the i2004 Internet Telephone

1 Configure a virtual loop on the Meridian/Succession CSE 1000 using LD 97.

2 Configure the i2004 Internet Telephone on Meridian/Succession CSE 1000 using LD 11.

3 Follow the steps in “Manual first-time i2004 Internet Telephone installation” on page 167 to install the footstand, Ethernet cable, power transformer, handset, handset cord.

4 Power up the i2004 Internet Telephone.

5 Connect the i2004 Internet Telephone to the LAN using the supplied Ethernet cable. The i2004 Internet Telephone automatically proceeds through its DHCP sequence.

6 The i2004 Internet Telephone prompts you for a node number and TN. Enter the node number and TN on the keypad.

7 Automatic i2004 Internet Telephone configuration is complete.

If the TN has not been previously configured on Meridian/Succession CSE 1000 or an invalid TN is used, a message is displayed on the screen of the i2004 Internet Telephone indicating "Invalid TN."

End of Procedure

i2004 Internet Telephone power cycle description

The power cycle is similar to the initial installation. The i2004 Internet Telephone saves its firmware, IP parameters, Node Number and TN in memory. As the i2004 Internet Telephone proceeds through a start-up sequence it does not need to re-enter the IP parameters if they were manually entered. It does not need to reacquire firmware or prompt the user for Node Number and TN.

Reinstall an i2004 Internet Telephone

You can reuse an existing, previously-configured i2004 Internet Telephone on the same Meridian/Succession CSE 1000. For example, the i2004 Internet Telephone can be assigned to a new user (new TN) or to an existing user who moved to a new subnet.

Change the TN of an existing i2004 Internet Telephone

Procedure 21
Changing the TN of an existing i2004 Internet Telephone

1 Power cycle the i2004 Internet Telephone.

2 During the reboot sequence of a previously-configured i2004 Internet Telephone, the i2004 Internet Telephone displays the existing node number and TN for approximately five seconds.

3 Press the "Clear" softkey during the five-second period. The existing node and TN will be cleared.

4 The i2004 Internet Telephone prompts the user for new Node Number and TN information.

End of Procedure

Replace an i2004 Internet Telephone

Procedure 22
Replacing an i2004 Internet Telephone

1 Use the Manual or Automatic first-time installation procedures, Procedures 19 and 20, described in this chapter to install and configure the i2004 Internet Telephone.

2 Enter the same TN and Node Number as the i2004 Internet Telephone you replaced. Meridian/Succession CSE 1000 ITG gateway associates the new i2004 Internet Telephone with the existing TN.

End of Procedure

Remove an i2004 Internet Telephone from service

Procedure 23
Taking an i2004 Internet telephone out of service

1 Disconnect the i2004 Internet Telephone from the network or turn the power off.

2 If the i2004 Internet Telephone was automatically configured, the DHCP lease will expire and the IP address returns to the available pool.

3 In Overlay 11, OUT the TN.

End of Procedure

i2004 Internet Telephone maintenance and diagnostics

In the i2004 Internet Telephone, there are two kinds of TNs to consider:

- Physical TN, which represents a physical unit of the ITG Line 2.1 card
- Virtual TN, which is configured on a virtual superloop and represents an i2004 Internet Telephone

Physical TNs, which are seen as card units, are managed using existing Overlay 32 commands.

Because virtual TNs are configured on virtual superloops, Virtual TN maintenance has no meaning. It is already provided by the Meridian/Succession CSE 1000 for phantom loops. In Overlay 32, any command affecting a phantom loop leads to an NTP665 message, since the loop does not physically exist. Overlay 32 supports STAT, DISU, ENLU and IDU commands on an i2004 Internet Telephone Virtual TN. All other commands lead to the new NPR047 message.

The IDU command provides the usual information, such as TN, TNID, NT code, color code, release code and serial number, as well as the IP address of the i2004 Internet Telephone and the IP address of the ITG Line 2.1 card that is acting as the terminal proxy. The serial number is the last three bytes of the i2004 Internet Telephone’s MAC address, printed in ASCII hex format.

Because Meridian/Succession CSE 1000 must request the information from the i2004 Internet Telephone, the IDU is effectively a "ping" command and can be used to test the end-to-end IP connectivity of the i2004 Internet Telephone. The output format of the IDU command in LD32 is shown in Table 24. This format only applies for i2004 Internet Telephone Virtual TNs.

If the i2004 Internet Telephone is not registered, an NPR0048 message is generated. If the i2004 Internet Telephone is registered but does not respond, the system prints the i2004 Internet Telephone IP address and ITG Line 2.1 card IP address and generates an NPR0503 message.

Table 24
IDU command printout in LD32

Item	Description
ISET TN:	l s c u
TN ID CODE:	I2004
NT CODE:	xxxxxx
COLOR CODE:	xx
RLS CODE:	xx
SER NUM:	xxxxxxx
SET IP ADR:	xxx.xxx.xxx.xxx
TPS IP ADR:	xxx.xxx.xxx.xxx

Table 25
LD32 Available Maintenance Commands for the i2004 Internet Telephone

Prompt	Response	Description
STAT lscu STAT cu	UNEQ IDLE REGISTERED IDLE UNREGISTERED. BUSY, DSBL REGISTERED DSBL UNREGISTERED	Display the i2004 state. UNEQ, IDLE, BUSY and DSBL have the usual meaning. IDLE and DSBL state are preceded by the following information: • UNREGISTERED identifies an i2004 Internet Telephone that is configured in the system but that has not yet registered. • REGISTERED identifies an i2004 Internet Telephone that has registered.
DISU l s c u DISU cu	OK	Change the i2004 Internet Telephone state to DSBL. UNREGISTERED/REGISTERED state is not modified.
ENLU l s c u ENLU cu	OK	Change the i2004 Internet Telephone state to IDLE. UNREGISTERED/REGISTERED state is not modified.
IDU l s c u IDU cu	Displays the TN number, device code, NT code, color code, release code, last three bytes of MAC address. Displays the IP address for i2004 Internet Telephones and the Terminal Proxy Server.	Displays selected i2004 Internet Telephone information.

Lamp audit and keep-alive function

The Meridian/Succession CSE 1000 Lamp Audit function provides a continuous source of heartbeat messages to ensure the i2004 Internet Telephone is powered and the IP connection is alive. Since there is a reliable UDP connection from the Meridian/Succession CSE 1000 1 core through to the i2004 Internet Telephone, any failure of the i2004 Internet Telephone, the ITG Line 2.1 card or the IP connection is detected.

You can run Network Signaling diagnostics as part of the midnight routines.

When the ITG Line 2.1 card detects the i2004 Internet Telephone has been disconnected, the ITG Line 2.1 card logs the event and sends an UNREGISTER message to the Meridian/Succession CSE 1000 for that i2004 Internet Telephone.

When the Meridian/Succession CSE 1000 CPU detects a loss of connection with the ITG Line 2.1 card, Meridian/Succession CSE 1000 logs a message and UNREGISTERS all of the i2004 Internet Telephones and gateway channels associated with that ITG Line 2.1 card.

ITG Line 2.1 card administration

Contents

This section contains information on the following topics:

Overview

This chapter explains how to administer the Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 card. The ITG Line 2.1 card provides three administration interfaces:

- Meridian Administration Tools/Optivity Telephony Management (MAT/OTM)

- Provides a graphical interface to the ITG Line 2.1 card. Use MAT/OTM to Telnet to the card, install and upgrade software, configure alarm event reporting, view and update card property and configuration data, add new cards to a node, schedule reports and other related tasks.

- Command Line Interface (CLI)

  - Use the CLI to display card and node status, change passwords, check software version, view channel states, and other card information. You can access the CLI through a direct serial connection to the I/O panel serial port, the Maint. Port on the faceplate, or through a Telnet session. Use a VT-100 terminal emulation program set to 9600 baud, 8 bits, no parity, one stop bit.

- Meridian/Succession CSE 1000 Overlays

  - Use the same commands and messages for the ITG Line 2.1 card as you use for the digital line (XDLC) card. This chapter explains how to use LD 32 for card maintenance.

MAT/OTM OA&M administration procedures

This section describes the MAT/OTM administration procedures you can perform using the MAT/OTM **ITG IP Phones** application. All of the references to MAT/OTM in the following procedures assume the latest MAT/OTM version: MAT6.67.07 (with update disk)/OTM 1.0.

To obtain the latest software versions information and files, refer to the M1 ESD website at URL:
"http://www.nortelnetworks.com/servsup/esd/meridian1/".

ITG operational measurement (OM) report scheduling and generation

Operational Measurement (OM) reports provide important statistical and traffic information and feedback to the system administrator to better engineer the system. The information stored in the OM file applies only to the calls routed over the IP network by way of ITG. OM reports give a quantitative view of system performance.

The OM reports are a collection of data from all the ITG Line 2.1 cards in the network. OM data is written to a file every hour. At midnight, the OM file is copied to a backup file, and the new day starts with a new file.

MAT/OTM uses the following naming convention for the OM file names:

itgIPPHONE_3_2000_file1

The user generates OM reports on demand or on a pre-selected schedule. When a report is generated, the application retrieves the latest OM data from each ITG Line 2.1 card defined in MAT/OTM.

> ***Note:*** Nortel Networks recommends that you schedule report generation once a day.

Procedure 24
Report scheduling

1 In the ITG Main window, click **File | Report | Generate.**

2 In the **ITG - Generate Report** window, select the **Schedule report generation** radio button.

3 Click **OK**. The Scheduling window appears (see Figure 30).

4 In the “Job” text box, enter the name and description of the schedule.

5 In the “Run” box, click the radio button that indicates the frequency of report generation

6 In the “Start at” box, enter the month, day, year, hour, and minute of the start of the report period. Select the “am” or “pm” radio button.

7 Click **Apply** and **OK**

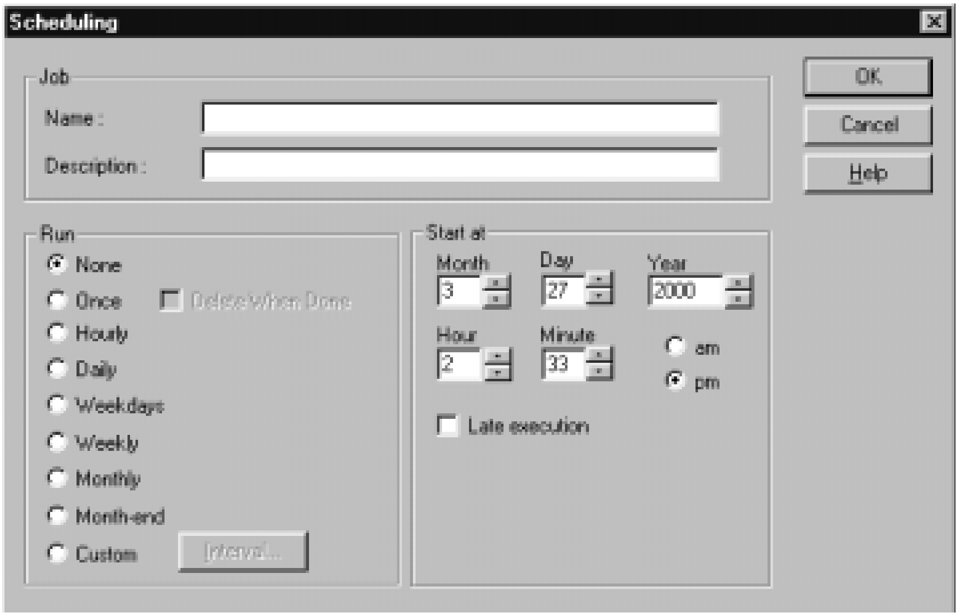
——————— ***End of Procedure*** ———————.

Procedure 25
Report generation

1 In the **IP Telephony Gateway- IP Phones** window, click **File** | **Report** | **Generate**.

2 In the **ITG - Generate Report** window, click **Generate OM Report now**.

Figure 30
Scheduling window



3 Click **OK**.

MAT/OTM creates and displays a report named "ITG IP Phones - Operational Measurement Report." The default display is Microsoft Excel.™

End of Procedure

Procedure 26
Open an Operational Measurement (OM) report

1 In the “IP Telephony Gateway - IP Phones” window, click **File | Report | Open**. The Open OM Report window opens (see Figure 31).

2 Select a report file and click **Open.** The file opens in a program that interprets.csv (comma-delimited) files such as Microsoft Excel.™

End of Procedure

Procedure 27
Viewing ITG info and error log

To view ITG error conditions that are abnormal events, but not severe enough to raise an alarm:

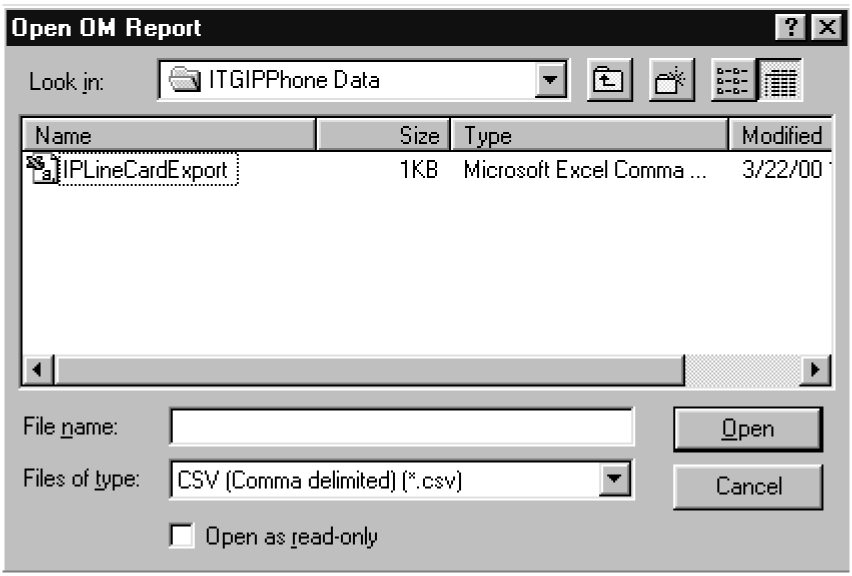
1 In the “MAT/OTM Navigator” window, select the **ITG IP Phones** icon from the “Services” folder.

2 In the “IP Telephony Gateway - IP Phones" window, click the right mouse button and select **Card | Properties** from the pop-up menu.

3 Click the **Open log file** button and review the file contents.

——— ***End of Procedure*** ———

Figure 31
Open OM Report



View ITG info and error log

MAT/OTM uses FTP to transfer the file from the ITG Line 2.1 card to the PC and open in the WordPad application. The ITG Error log file displays error information, including error date/time, the originating module (ITG node), and specific error data.

Configure SNMP traps

Procedure 28
Configuring SNMP Traps

1 Return to the "MAT/OTM Navigator" window.

2 In the MAT/OTM Navigator window select **Utilities | Alarm Notification**. The "MAT/OTM Alarm Notification" dialog box appears (Figure 32).

3 Select **Configuration | Run Options**.

The "Alarm Notification Run Options" dialog box appears.

4 Click the **Control Files** tab.

5 Click **Devices | Browse**. The "Open" dialog box appears.

6 Select the "Devices.txt" file from the "Control Files" folder and click **Open**. The "Devices.txt" file opens.

7 For each ITG Line 2.1 card in each monitored ITG Line 2.1 card node, add a line consisting of three fields separated by spaces, as shown in Table 26. Enter the first line under the last line that begins with a "#".

8 Click **File|Save**.

9 In the "Alarm Notification Run Options" window, click **Apply** then **OK**.

Note: MAT/OTM Alarm Notification must be restarted whenever Control Files are changed.

10 If MAT/OTM Alarm Notification is running (i.e., the red traffic light is showing on the tool bar), first stop it by clicking on the red traffic light on the tool bar. Restart it by clicking on the green traffic light.

11 If MAT/OTM Alarm Notification is not running (i.e., green traffic light showing on the tool bar), start it by clicking on the green traffic light to change it to red.

12 Enter the **trap_gen** command from the ITG shell. A series of SNMP traps is emitted by the ITG Line 2.1 card and appears in the MAT/OTM Alarm Notification browser window. Verify the device name identifies the correct ITG Line 2.1 card.

End of Procedure

Figure 32
Alarm Notification Run Options (General tab)

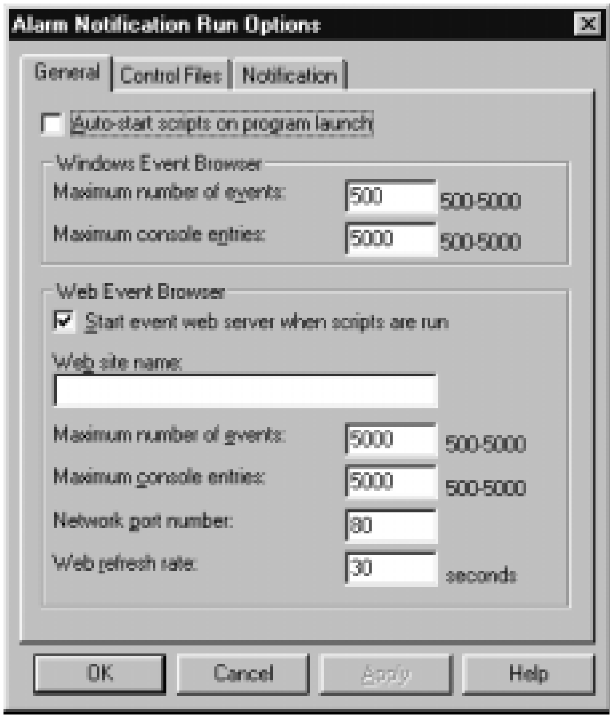


Figure 33
Alarm Notification Run Options (Control Files tab)

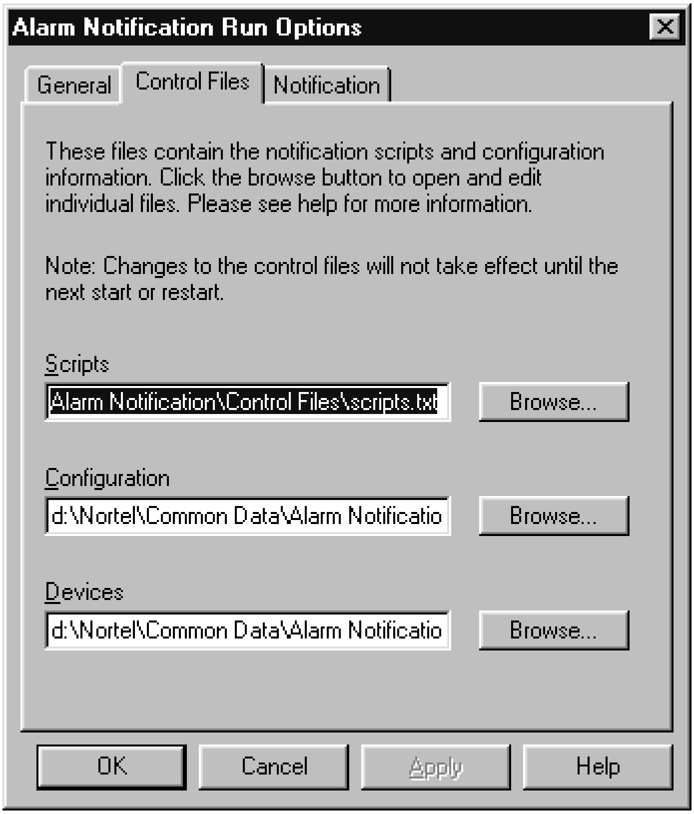


Figure 34
Open dialog box

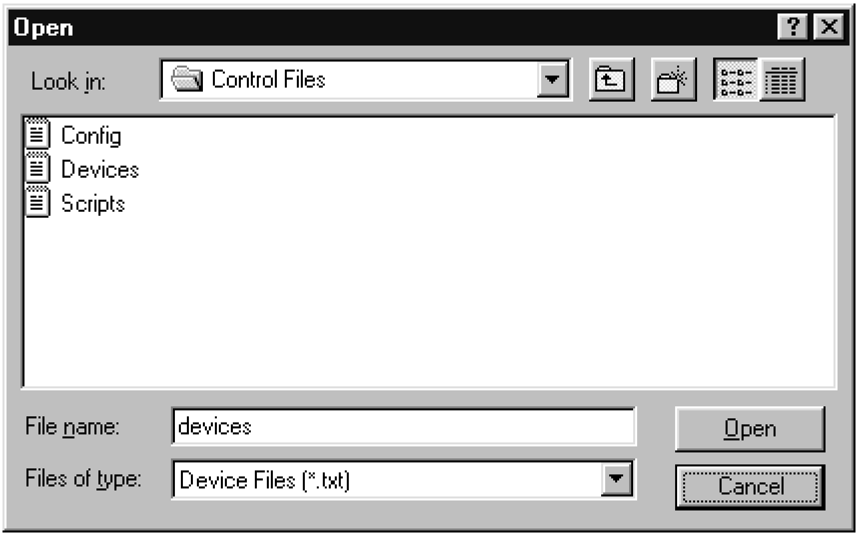
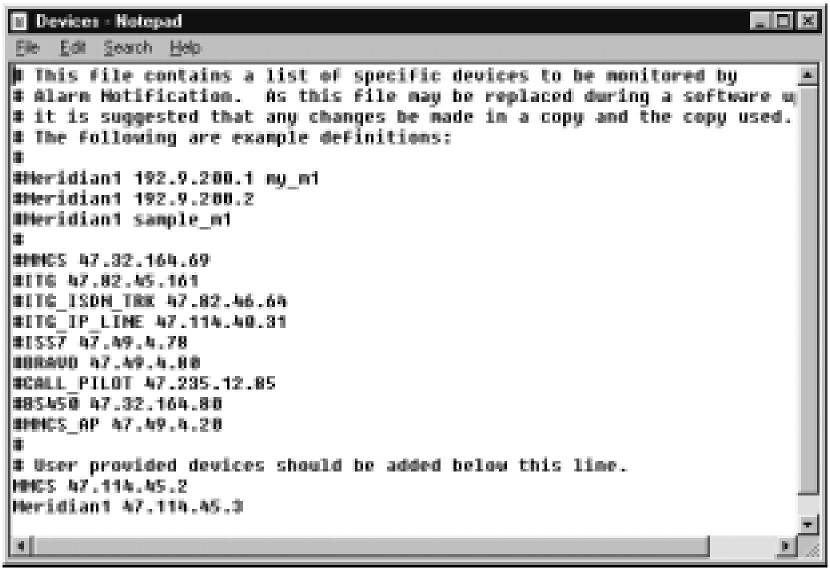


Figure 35
Devices.txt Notepad



Devices - Notepad

File Edit Search Help

```
# This file contains a list of specific devices to be monitored by
# Alarm Notification.  As this file may be replaced during a software u
# it is suggested that any changes be made in a copy and the copy used.
# The following are example definitions:
#
#Meridian1 192.9.200.1 my_m1
#Meridian1 192.9.200.2
#Meridian1 sample_m1
#
#MMCS 47.32.164.69
#ITG 47.82.45.161
#ITG_ISDN_TRK 47.82.46.64
#ITG_IP_LINE 47.114.40.31
#ISS7 47.49.4.78
#DRAVD 47.49.4.80
#CALL_PILOT 47.235.12.85
#85450 47.32.164.80
#MMCS_AP 47.49.4.20
#
# User provided devices should be added below this line.
MMCS 47.114.45.2
Meridian1 47.114.45.3
```

Table 26
Format of Devices.txt file

Device Type	IP Address	Device Name
ITG_IP_PHONES	xxx.xxx.xxx.xxx	Site_Leader_0
ITG_IP_PHONES	xxx.xxx.xxx.xxx	Site_Leader_1
ITG_IP_PHONES	xxx.xxx.xxx.xxx	Site_Follower_2

Back up and restore MAT/OTM data

The MAT/OTM Backup Wizard is used to backup and restore any or all of MAT/OTM PC based data, including ITG MAT/OTM data. All of the ITG data is stored in an Access database file on the MAT/OTM PC or Server. This file is only backed up when the user selects the "Disaster Recovery" option. This option backs up all MAT/OTM data and can only be used to restore all data.

For more information on using the MAT/OTM Backup Wizard, see the *Common Services User Guide* in the *MAT/OTM User Guides*.

Update ITG node properties

Procedure 29
Updating the ITG node properties:

1. In the MAT/OTM Navigator window, select the **ITG IP Phones** icon from the "Services" folder. The system displays the "**IP Telephony Gateway - IP Phones**" screen.
2. Click the right mouse button on a card and select **Node | Properties** from the pop-up menu.
3. Perform all required updates to the ITG Node "General" tab parameters.
4. If you add or delete ITG Line 2.1 cards from the node or change an ITG Line 2.1 card (refer to the Maintenance section for the procedure to replace an ITG Line 2.1 card), then use one of the following procedures:
   - "Delete an ITG Line 2.1 card from the node" on page 188
   - "Change an IP address" on page 188

End of Procedure

Add an ITG Line 2.1 card to the node

Procedure 30
Adding an ITG Line 2.1 card to the node

Refer to "Installation and configuration of ITG Line 2.1 node" on page 111 and Procedure 5 "Add an ITG Line 2.1 node manually" on page 128, to add a card to a node.

Delete an ITG Line 2.1 card from the node

Procedure 31
Deleting an ITG Line card from the node

1 In the “MAT/OTM Navigator” window select the **ITG IP Phones** icon from the “Services” folder.

2 If the ITG Line 2.1 card to be deleted is a Leader 0 or Leader 1, then:

- Telnet to the card.
- Enter the **clearLeader** command from the ITG shell.

3 In the “IP Telephony Gateway - IP Phones” window, select **Node | Properties** from the popup menu. The ITG Node Properties window is displayed.

4 Click the “Configuration” tab.

5 Select the ITG Line 2.1 card to be deleted from the list.

6 Click the **Delete** button.

7 Click **OK**.

8 Remove the ITG Line 2.1 cards via the MAT/OTM System Passthru terminal, ESN MAT/OTM application, or via a Meridian/Succession CSE 1000 system management terminal directly connected to a TTY port on the Meridian/Succession CSE 1000. Use Overlay 11.

——————————— End of Procedure ———————————

Change an IP address

Procedure 32
Changing the IP address of an ITG Line 2.1 card

1 Click **Configuration | Node | Properties**. Update the ITG Line 2.1 card IP addresses as required.

2 When all updates to the IP addresses have been made, click **Apply** then **OK** in the “ITG Node Properties” window.

The node properties are transmitted to the Leader 0 card:

3 Select the Leader 0 ITG Line 2.1 card in the IP Telephony Gateway - IP Phones window.

4 Click the **Configuration** menu, then **Synchronize**, then **Transmit**.

5 Click the “Transmit to selected nodes” radio button.

6 Click the “Node Properties” check box.

7 Click the **Start Download** button.

The results of the download appear in the “Transmit control” box.

8 Click **Close**.

9 If you have changed the IP addresses of any cards, restart the cards for the changes to take effect.

End of Procedure

Update ITG Line 2.1 card properties

Note: Some basic ITG Line 2.1 card configuration, including IP address configuration, must be performed from the ITG Node Properties window, as described in “Update ITG node properties” on page 187.

Procedure 33
Updating card properties

1 In the “MAT/OTM Navigator” window, select the **ITG IP Phones** icon from the “Services” folder.

2 In the “IP Telephony Gateway - IP Phones” window, select the ITG Line 2.1 card to be modified.

3 Select the ITG Line 2.1 card to be updated and click the right mouse button to select **Cards | Properties** from the pop-up menu. The “ITG Line 2.1 card Properties” window appears. The “Configuration, SNMP traps, and Security” tabs are described following step 3.

4 Make the required changes to the ITG Line 2.1 card configuration.

5 Click **Apply** then **OK**.

End of Procedure

Use the Retrieve command

The Retrieve command sends information from the ITG Line 2.1 cards to the MAT /OTM ITG node. The Retrieve command is used for:

- a remote MAT/OTM user to download a node or card configuration

  Note: This can also be performed by doing the “Add ITG Node” command and selecting the “Retrieve the active configuration from an existing node” option.

- for copying node information from one node to another
- for restoring accidentally changed MAT/OTM information, and
- for downloading information to a fictitious “dummy” node that has been created for this purpose, in order to view the configuration of the ITG Line 2.1 cards and node.

Procedure 34
Using the Retrieve command:

1 In the “IP Telephony Gateway- IP Phones” window, select the card(s) from which to retrieve information.

2 Click **Configuration | Synchronize | Retrieve**.

3 Configure whether to retrieve “Node properties” or “Card properties.” Click one or more of the check boxes.

4 Click **Start Retrieve**. The results of the Retrieve command are displayed in the “Retrieve control” box.

End of Procedure

Add an ITG node on MAT/OTM by retrieving an existing node

Use this optional procedure in the following cases:

- Add existing nodes to a particular MAT/OTM ITG PC to manage the ITG network from a single point of view.
- Restore the ITG configuration database to a MAT/OTM ITG PC whose hard drive had crashed, as an alternative to restoring the MAT/OTM ITG nodes from the MAT/OTM Disaster Recovery Backup.

When you install and configure the ITG node manually, you can then add that node to another MAT/OTM ITG PC by retrieving the configuration data from the existing ITG node.

Make sure that you configure the site name, system name, and customer number in the MAT/OTM Navigator before you can add a new ITG node. Only one ITG node can be added in the MAT/OTM ITG application for each Meridian/Succession CSE 1000 customer.

> ***Note:*** If multiple MAT/OTM ITG PCs are used to manage the same ITG network, care must be taken to synchronize the different copies of the ITG database. The MAT/OTM ITG **Configuration | Synchronize | Retrieve** function can be used to synchronize the MAT/OTM ITG database with the database on the ITG node.

Procedure 35
Configuring the node and Leader 0

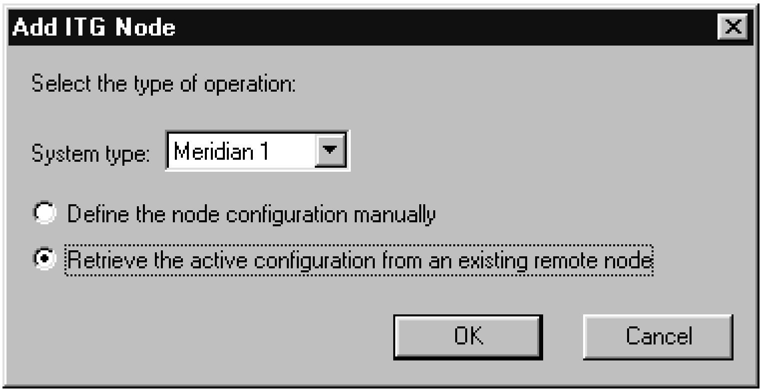
1 Launch the Meridian Administration Tools application on the MAT/OTM PC.

2 From the “MAT/OTM Navigator” window, double-click the **ITG IP Phones** icon from the “Services” folder. The “IP Telephony Gateway - IP Phone” window opens.

3 In the “IP Telephony Gateway - IP phone” window, click the **Configuration** menu and select **Node**, then **Add**.

4 When the Add ITG Node dialog box (see Figure 36) appears, click “Retrieve the active configuration from an existing remote node” and click **OK.** The **Retrieve ITG Node** window opens (see Figure 37).

Figure 36
Add ITG Node dialog box



5 In the “Retrieve ITG node” window, select the “MAT/OTM Site”, and “Meridian 1 System” fields. Select the “Meridian 1 Customer” number.

Note: The site name, Meridian 1 system name, and Meridian 1 customer number must exist in the MAT/OTM Navigator before you can add a new ITG node. Only one ITG node can be added in the MAT/OTM ITG application per Meridian/Succession CSE 1000 customer.

6 Enter the active leader management IP address field for the existing node.

7 Enter the SNMP read/write community name. The default is “private”.

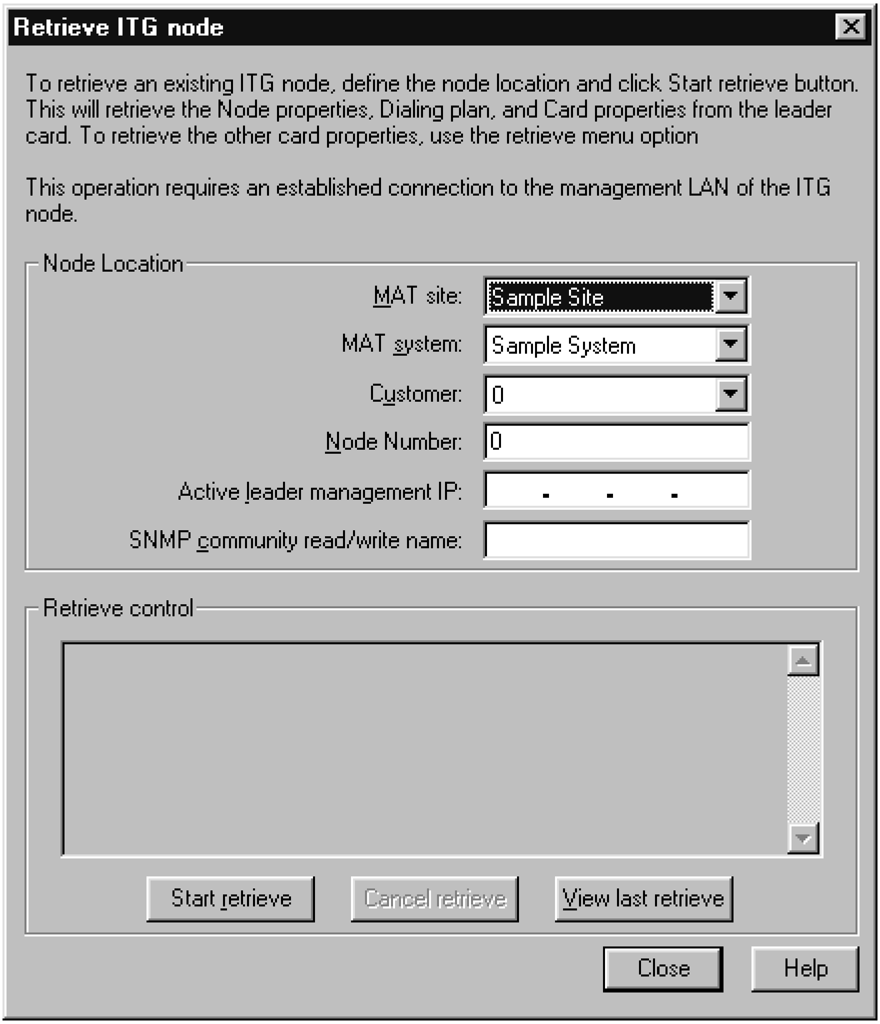
8 Click **Start Retrieve**.

The results of the retrieval are shown in the “Retrieve control” dialog box. The node properties are retrieved from the active leader. The card properties are retrieved from Leader 0.

9 Click **Close** when the download is complete.

10 Refresh the card status from the View menu, and verify that the cards in the newly added node are responding.

Figure 37
Retrieve ITG node



11 In the main window, select Leader 0 of the newly added node.

12 Use the **Configuration|Synchronize|Retrieve** command to retrieve the card properties for all ITG Line 2.1 cards in the selected node.

End of Procedure

ITG shell command-line interface access via Telnet or maintenance port

There are two ways to access the Command Line Interface (CLI):

1 Use the NTAG81CA (or NTAG81BA) cable to connect the faceplate or I/O cable serial port to a TTY or PC Com port.

2 Telnet to the card. You can Telnet to the card from the MAT/OTM IP Telephony Gateway - IP Phones Main Window or use the Telnet application on your computer.

> **CAUTION**
> Do not connect two maintenance terminals to both the faceplate and I/O panel serial maintenance port connections at the same time.

Telnet to an ITG Line 2.1 card

To access the command line on an ITG Line 2.1 card from the MAT/OTM PC, perform Procedure 36 on page 194.

Procedure 36
Telnet to an ITG Line 2.1 card

1 In the “MAT/OTM Navigator” window select the **ITG IP Phones** icon from the “Services” folder.

2 In the “IP Telephony Gateway - IP Phones” window click the right mouse button on the ITG Line 2.1 card that you wish to access and select **Card | Telnet to IP Telephony Gateway Line 2.0 card** from the popup menu.

3 The default user name and password are **itgadmin**.

4 The MAT/OTM PC opens a Telnet window and automatically connects to the ITG Line 2.1 card by using the management IP address. Enter a username and password to access the ITG shell command-line interface.

End of Procedure

Telnet and FTP security information

Good security policy requires changing user names and passwords periodically. The ITG user name and password protects FTP and Telnet access to the ITG Line 2.1 card over the LAN.

Procedure 37
Changing the username and password

1 From the ITG shell use the command **shellPasswordSet** to change the default user name and password for Telnet to ITG shell and FTP to the ITG Line 2.1 card file system.

The default user name is **itgadmin** and the default password is **itgadmin**.

2 You will be prompted as follows:

Enter current username: itgadmin
Enter current password: itgadmin
Enter new username: newname
Enter new password:newpwd
Enter new password again to confirm: newpwd

If the entire sequence of commands is successfully entered, you get the system response with'value = 0 = 0x0'. The new user name and password are now stored in the non-volatile RAM on the ITG Line 2.1 card, and will be retained even if the card is reset, powered-off, or on.

End of Procedure

Download the ITG operational measurements through the ITG shell

The ITG Line 2.1 card operational measurements file contains counts of incoming and outgoing calls, call attempts, calls completed, and total holding time for voice calls. To download this file from the ITG Line 2.1 card use the MAT/OTM PC and perform Procedure 38 "Downloading ITG data from the MAT PC" on page 196.

Procedure 38
Downloading ITG data from the MAT PC

1 At the ITG shell prompt, type: **currGKOMFilePut** <*hostname, username, password, directory path, filename*> for the current file, or **prevGKOMFilePut** <*hostname, username, password, directory path, filename*> for the previous file.

——— ***End of Procedure*** ———

Reset the operational measurements

This command resets all operational measurement (OM) parameters that have been collected since the last log dump.

At the ITG shell prompt, type: **resetOM**.

Display the number of DSPs

This command displays the number of DSPs on the ITG Line 2.1 card.

At the ITG shell prompt, type: **DSPNumShow**

Display ITG Node Properties

This command displays information about an ITG node.

At the ITG shell prompt, type: **IPInfoShow**

The following ITG node information is displayed on the TTY:

- IP addresses for the management and voice subnets
- default router for the management and voice subnets
- subnet mask for the management and voice subnets

- SNMP manager

Display ITG card properties

To display information about an ITG Line 2.1 card, enter the following command: **itgCardShow**

The following commands give additional information about an ITG Line 2.1 card:

- ifShow
- serialNumShow
- firmwareVersionShow
- swVersionShow

Transfer files using the command-line interface

To transfer a file from the ITG Line 2.1 to the MAT/OTM PC or from the MAT/OTM PC to the ITG Line 2.1 card, enter one of the ITG line commands at the ITG shell command-line, depending on what type of file transfer is to occur.

These commands are from the perspective of the ITG Line 2.1 card: that is, commands containing "Get" as part of the command refer to file transfer from the MAT/OTM PC to the ITG Line 2.1 card, while commands containing "Put" as part of the command refer to file transfer from the ITG Line 2.1 card to the MAT/OTM PC:

> ***Note 1:*** These commands are *case-sensitive*. The parameters following the command must each be enclosed in quotes, and there must be a comma and no spaces between the parameters.

> ***Note 2:*** Refer to "ITG Line 2.1 card maintenance" on page 205 for a complete description of the various ITG shell file transfer commands.

> ***Note 3:*** *Hostname* refers to the either IP address of the FTP host, or the ITG Line 2.1 card itself or another ITG Line 2.1 card when a PC card in the A: drive or C: drive (the swDownload command must only use the A: drive), of the ITG Line 2.1 card contains the software binary file.

The following commands can be entered at the ITG shell command-line:

Table 27
ITGL Shell Commands

Shell commands
swDownload *<hostname> <username> <password> <directory path> <filename>*
configFileGet *<hostname> <username> <password> <directory path> <filename>*
bootPFileGet *<hostname> <username> <password> <directory path> <filename>*
bootPFilePut *<hostname> <username> <password> <directory path> <filename>*
hostFileGet *<hostname> <username> <password> <directory path> <filename> <ITGFileName> <listener>*
currOMFilePut *<hostname> <username> <password> <directory path> <filename>*
prevOMFilePut *<hostname> <username> <password> <directory path> <filename>*
traceFilePut *<hostname> <username> <password> <directory path> <filename>*
LogFilePut *<hostname> <username> <password> <directory path> <filename>*
configFilePut *<hostname> <username> <password> <directory path> <filename>*
hostFilePut *<hostname> <username> <password> <directory path> <filename> <ITGFileName>*

IP configuration commands

Table 28
IP configuration commands

IP configuration command	Function
setLeader	Performs all the necessary actions to make a leader. Sets IP address, gateway, subnet mask, boot method to static, and leader bit in NVRAM.
clearLeader	Clears the leader info in NVRAM and sets the boot method to use bootp, thus, making the card a follower:
NVRIPShow	Prints the values of the IP parameters that reside in NVRAM.

Configure TLAN parameters

Auto-negotiate mode can be disabled if the ports on some data network hubs and routers are manually configured by the user. For example, configuring a port for 100BaseT full duplex can disable auto-negotiation on the signaling link.

The ITG Line 2.1 card and i2004 phone default to half duplex mode when no auto-negotiation signaling occurs. The result is that the ITG Line 2.1 card/ i2004 phone operates in half duplex mode, while the hub is in full duplex mode. Communication continues, but random packet can occur which affects the correct operation and voice quality.

The following is recommended:

> IMPORTANT
> Set ports for auto-negotiation, auto-sense.

Configure the speed and duplex of the TLAN connection using the following commands:

- **tLanSpeedSet speed**. This command sets the speed of the TLAN interface. By default, the interface auto-negotiates to the highest speed supported by the hub or switch. If the switch is 10/100BT, the interface negotiates to 100BT. Use this tLanSpeedSet speed command to debug Ethernet speed-related problems by forcing the interface to 10BT operation immediately. The duplex mode setting is saved in NVRAM and read at startup. The parameter speed is set to the following:

  10 - enables 10MB only operation
  10100 - enables auto-negotiation

- **tLanDuplexSet duplexMode.** This command immediately sets the duplex mode of the TLAN interface while operating in 10BT mode. The duplex mode is saved in NVRAM and read at startup. The parameter duplexMode is set to the following:

  0 - enables full duplex mode
  1 - enables half duplex mode

Configure voice activity detection

Configure and view Voice Activity Detection using the following commands:

- **itgSetVAD 0|1**. This command configures voice activity detection to off (0) or on (1). This setting overrides the codec configuration. The setting is not permanently stored and the setting is lost if the card is rebooted.
- **itgVADShow**. This command displays the current VAD configuration and DSP setting.

Packet loss monitor

Monitor audio packet loss using the following commands:

- **vgwPLLog 0|1|2**. This command enables the packet loss monitor. A value of zero disables packet loss logging. A value of one logs a message if packet loss during the course of the call exceeds the threshold set with the itgPLThreshold command. Packet loss is measured in the receive direction and the two halves of a call are monitored and logged independently.
- **itgPLThreshold xxx**. This command sets the packet loss logging and alarm threshold. xxx is a number between 1 and 1000, and represents the threshold in 0.1% increments. Packet loss which exceeds the threshold, generates an SNMP trap and writes a message to the log file if logging is enabled. The default value is 10 (1%).

Download the ITG error log

The ITG error log contains error conditions as well as normal events. Some of the error conditions can be severe enough to raise an alarm through SNMP traps.

Use the LogFilePut command to download an ITG error log.

Lamp audit and keep-alive function

The Meridian/Succession CSE 1000 Lamp Audit function provides a continuous source of heartbeat messages to ensure the i2004 Internet Telephone is powered and the IP connection is alive. Since there is a reliable UDP connection from the Meridian/Succession CSE 1000 core through to the i2004 Internet Telephone, any failure of the i2004 Internet Telephone, the ITG Line 2.1 card or the IP connection is detected.

You can run Network Signaling diagnostics as part of the midnight routines. When the ITG Line 2.1 card detects the i2004 Internet Telephone has been disconnected, the ITG Line 2.1 card logs the event and sends an UNREGISTER message to the Meridian/Succession CSE 1000 for that i2004 Internet Telephone. When the Meridian/Succession CSE 1000 CPU detects a loss of connection with the ITG Line 2.1 card, it logs a message and UNREGISTERS all of the i2004 Internet Telephones and gateway channels associated with that ITG Line 2.1 card. Table 29 summarizes the Meridian/Succession CSE 1000 system administration commands available in Overlay 32.

Table 29
LD 32 - Administration commands for the ITG Line 2.1 card

Command	Function
DISC l s c	Disable the specified card, where: l = loop, s = shelf, c = card. ***Note 1:*** You must disable the ITG Line 2.1 card before you transmit card properties from the MAT/OTM ITG IP Phones application. ***Note 2:*** The card reset button is only available in the MAT/OTM ITG application when the card is disabled. ***Note 3:*** When you disable the ITG Line 2.1 card in LD 32 it does not disable the active leader or backup leader functions.
DISI l s c	Disable the specified card when idle, where: l = loop, s = shelf, c = card ***Note 1:*** This will temporarily prevent the ITG node from seizing the port from incoming calls. ***Note 2:*** You should use the DISI command to disable the ITG Line 2.1 card instead of the DISC command. The disabled state of the ITG Line 2.1 card is indicated by the NPR0011 message.
DISU l s c u	Disable the specified unit, where: l = loop, s = shelf, c = card, u = unit
ENLC l s c	Enable the specified card, where: l = loop, s = shelf, c = card
ENLU l s c u	Enable the specified unit, where: l = loop, s = shelf, c = card, u = unit
IDC l s c	Print the Card ID information for the specified card, where: l = loop, s = shelf, c = card ***Note 1:*** This command will display the PEC (Product Engineering Code) and serial number for the card. The ITG Line 2.1 PEC is NTZC80AA.

Table 29
LD 32 - Administration commands for the ITG Line 2.1 card

Command	Function
STAT l s c	Print the Meridian/Succession CSE 1000 software status of the specified card. where: l = loop, s = shelf, c = card
STAT l s c u	Print the Meridian/Succession CSE 1000 software status of the specified unit, where: l = loop, s = shelf, c = card, u = unit

ITG Line 2.1 card maintenance

Contents

This section contains information on the following topics:

Overview

This chapter provides information on maintenance functions of the Meridian/Succession Communication Server for Enterprise (CSE) 1000 Internet Telephony Gateway (ITG) Line 2.1 card. Where reference is made to Meridian Administrative Tools/Optivity Telephone Management (MAT/OTM), the latest version, MAT 6.67.07(with update disk and loss plan patch)/OTM 1.0 (or later), is assumed.

> ***Note:*** Check the M1 ESD website for information on the latest software, firmware and application releases. Refer to Procedure 15 on page 153 to for verification steps.

Faceplate maintenance display codes

The ITG Line 2.1 card maintenance display provides the diagnostic status of the card during power-up, its operational state when in service, and error information on the functional state of the card. Table 30, “Faceplate maintenance display codes,” on page 207 lists the normal and fault codes.

During power-up, the card performs multiple self-tests, including an internal RAM test, ALU test, address mode test, Boot ROM test, timer test, and external RAM test. If any of these tests fail, the card will enter a maintenance loop, and no further processing will be possible. A failure message is printed on the display to indicate which test failed. For example, if the timer test fails, “F:05” is displayed.

If any of the other tests fail (up to and including the EEPROM test), a message is displayed for three seconds. If more than one test fails, the message displayed will indicate the first failure. If verbose mode has been selected (by the test input pin on the backplane), the three second failure message is not displayed.

If the maintenance display shows a persistent T:20 indicating an ITG software failure and if this occurs after the card was reset during a software download procedure, call your Nortel Networks technical support for assistance in attempting to download new software onto the card

Table 30
Faceplate maintenance display codes

Normal code	Fault code	Message
T:00	F:00	Initialization
T:01	F:01	Testing Internal RAM
T:02	F:02	Testing ALU
T:03	F:03	Testing address mode
T:04	F:04	Testing Boot ROM
T:05	F:05	Testing timers
T:06	F:06	Testing watchdog
T:07	F:07	Testing external RAM
T:08	F:08	Testing Host DPRAM
T:09	F:09	Testing DS30 DPRAM
T:10	F:10	Testing Security Device
T:11	F:11	Testing Flash memory
T:12	F:12	Programming PCI FPGA
T:13	F:13	Programming DS30 FPGA
T:14	F:14	Programming CEMUX FPGA
T:15	F:15	Programming DSP FPGA
T:16	F:16	Testing CEMUX interface
T:17	F:17	Testing EEPROM
T:18	F:18	Booting processor, waiting for response with self-test information
T:19	F:19	Waiting for application start-up messages from processor.

T:20		CardLAN enabled, transmitting bootp requests. If this display persists, then the ITG Line 2.1 card is running in BIOS ROM mode due to card software failure.
T:21		CardLAN operational, A07 enabled , display now under host control. Card is looking for an active leader by sending bootp requests on the management LAN. If no bootp response is received on the management LAN, Leader 0 times out first and starts active leader tasks. Leader 1 has a longer time out and normally starts backup leader, otherwise Leader 1 times out and starts active leader tasks. A follower card sends bootp requests on the management LAN continuously and never times out. Enter “+++” to escape from bootp request mode and start ITG shell.
T:22		The ITG Line 2.1 card is attempting to start the application.
Lxxx		Card is running active leader tasks, where xxx = number of i2004 Internet Telephones registered on the card
Fxxx		Card has detected the active leader, and is running Follower tasks, where xxx = number of i2004 Internet Telephones registered on the card

System error messages

When an error or specific event occurs, SNMP sends an alarm trap to MAT/OTM or any SNMP manager that is configured in the SNMP Manager's list in the ITG Line 2.1 card properties. It also puts the system error message into the error log file containing error messages.

You can view the error log in MAT/OTM ITG by clicking on the 'Open Log File' button on the "Maintenance" tab of the ITG Line 2.1 card properties. You can also view the log file in any text browser after uploading it to an FTP host using the LogFilePut command.

Error messages with a severity category of "Critical", are displayed on the ITG maintenance face plate in the form: "**Gxxx**", or "**Sxxx**", where "**xxx**" is the last three digits of the ITG or ITS message. Table 31 on page 209 lists the critical ITG and ITS messages.

Table 31
Critical ITG and ITS Error messages

Maintenance Display	Corresponding Circuital Error Message	Description
G000	ITG1000	Card (re)booted,
G001	ITG1001	Task spawn failure <name>.
G002	ITG1002	Memory allocation failure.
G003	ITG1003	File IO error <operation> <object> <errno> <errtext>.
G004	ITG1004	Network IO error <operation> <object> <errno> <errtext>.
G005	ITG1005	Message queue error <operation> <object> <errno> <errtext>.
G006	ITG1006	Unexpected state encountered <file> <line> <state>.
G007	ITG1007	Unexpected message type <file> <line> <msg>.

Table 31
Critical ITG and ITS Error messages

Maintenance Display	Corresponding Circuital Error Message	Description
G008	ITG1008	Null pointer encountered <file> <line> Name of pointer.
G009	ITG1009	Invalid block <file> <line> Type of block.
G010	ITG1010	Unable to locate data block <file> <line> Type of block.
G011	ITG1011	Failed to push file <file> <host>.
G012	ITG1012	Failed to retrieve file <file> <host>.
G013	ITG1013	Voice ethernet receive buffer unavailable, packet(s) discarded.
G014	ITG1014	Management ethernet receive buffer unavailable, packet(s), discarded.
G015	ITG1015	Voice ethernet device failure.
G016	ITG1016	Management ethernet device failure.
G017	ITG1017	Invalid or unknown A07 SSD message <tn> <msg>.
G018	ITG1018	Invalid or unknown X12 SSD message <tn> <msg>.
G019	ITG1019	DSP channel open failure <channel>.
G020	ITG1020	Configuration error <param> <value> <reason>.
G021	ITG1021	DSP successfully reset <dsp>.
G022	ITG1022	DSP channel not responding, channel disabled <channel>.

Table 31
Critical ITG and ITS Error messages

Maintenance Display	Corresponding Circuital Error Message	Description
G023	ITG1023	DSP device failure, operating at reduced capacity <dsp>.
G024	ITG1024	DSP failure <dsp> <errno> <errtext>.
G025	ITG1025	DSP download failed retrying <dsp>.
G026	ITG1026	DSP download retry succeeded <dsp>.
G027	ITG1027	DSP memory test timed out <dsp>.
G028	ITG1028	DSP memory test failed <dsp>.
G029	ITG1029	Error in DSP task <file> <line> <errno> <errtext>.
G030	ITG1030	Channel registration failure <channel> <errno> <errtext>.
G031	ITG1031	Allocation failure in DSP memory pool.
G032	ITG1032	Invalid codec number <codec>.
G033	ITG1033	Duplicate open attempt on channel <channel>.
G034	ITG1034	DSP channel send failure <channel>.
G035	ITG1035	Channel unexpectedly closed <channel>.
G036	ITG1036	Encountered unexpected open channel, closed it <channel>.
S000	ITS1000	VTI function call timeout.
S001	ITS1001	User terminal registration failed. <ip> <hwid> <errno> <errtext>.

Table 31
Critical ITG and ITS Error messages

Maintenance Display	Corresponding Circuital Error Message	Description
S002	ITS1002	Connect service activation error <reason>.
S003	ITS1003	Duplicate master <node> <ip1> <ip2>.
S004	ITS1004	Failed to retrieve node ID and TN <ip> <hwid>
S005	ITS1005	Invalid node ID <ip> <hwid>.
S006	ITS1006	Corrupted node ID/TN field <ip> <hwid>.
S007	ITS1007	Received corrupted UNIStim message <message dump>.
S008	ITS1008	Received unknown UNIStim message <message dump>.
S009	ITS1009	RUDP connection lost: <ip>.
S010	ITS1010	RUDP connection restarted: <ip>.
S011	ITS1011	Communication link to M1 is down.

Replacing an ITG Line 2.1 card

Replace the ITG Line 2.1 card when the following conditions occur, or the card is removed for other reasons:

- If, following a reboot, the ITG Line 2.1 card displays a code of the form “F:xx” on the faceplate LED display, this indicates an unrecoverable hardware failure and the card will not register with the Meridian/Succession CSE 1000. The exception is the "F:10" code, which may indicate that the Security Device is missing from the card.

- If the management Ethernet interface or the voice Ethernet interface on the ITG Line 2.1 card has failed. This can be indicated by failure to show a link pulse on the voice IP interface status LED, or on the hub, or if the maintenance port continuously prints'lnIsa0 Carrier Failure' messages, after proving that the hub port and T-LAN cable are good.
- If a voice channel on the ITG Line 2.1 card has a consistent voice quality fault, such as persistent noise or lack of voice path, even after resetting the card and retransmitting the card properties.

Procedure 39
Replacing an ITG Line 2.1 card

1 Before replacing the ITG Line 2.1 card, first remove it for 2-3 seconds and then reseat the card in the IPE shelf in order to perform a power-on reset. If the failure persists, there is no option but to replace the card. Continue with the following steps.

2 Locate the faulty card in the MAT/OTM ITG database by the TN, MAC address, and IP address.

3 Disable the faulty ITG Line 2.1 card in Overlay 32 with the **DISI** command. The Meridian/Succession CSE 1000 outputs "NPR0011" when the card has been completely disabled by the DISI command.

4 Remove the faulty ITG Line 2.1 card from the Meridian/Succession CSE 1000.

Note: This will force all i2004 Internet telephones registered on this card to re-register. If there are sufficient resources this can take up to several minutes. If there are not sufficient resources, the i2004 Internet Telephones can remain unregistered indefinitely.

5 Select Leader 0 or any ITG Line 2.1 card in the node.

6 Click **Configuration | Node | Properties** in the "IP Telephony Gateway" window.

7 Click the **Card Configuration** tab in the "ITG Node Properties" window.

8 In the "Card Configuration" tab, select the faulty ITG Line 2.1 card from the list of cards in the node.

9 Change the "Management MAC" to the MAC address of the replacement ITG Line 2.1 card. The MAC address is the Motherboard Ethernet address labeled on the faceplate of the replacement ITG Line 2.1 card.

10 Click **Change** and then **OK**.

11 Select Leader 0 or any ITG Line 2.1 card in the node.

12 Use the **Configuration | Synchronize | Transmit** command to transmit the Node Properties from MAT/OTM to the active leader card (Leader 0 or Leader 1) of the ITG node. Leave the default radio button selection "Transmit to Selected Nodes". Check the **Node Properties** box, and then click **Start Transmit**. This will update the node properties on the active leader card with the MAC Address of the replacement ITG Line 2.1 card.

13 Install the replacement ITG Line 2.1 card into the card slots in the Meridian/Succession CSE 1000 IPE module or Option 11 cabinet:

- **a** Pull the top and bottom locking devices away from the ITG faceplate.
- **b** Insert the ITG Line 2.1 card into the card guides and gently push it until it makes contact with the backplane connector. Hook the locking devices.

Note 1: When ITG Line 2.1 cards are installed, the red LED on the faceplate remains lit until the card is configured and enabled in software, at which point in turns off. If the LED does not follow the pattern described or operates in any other manner (such as continually flashing or remaining weakly lit), replace the card.

Note 2: Observe the ITG faceplate maintenance display to see startup selftest results and status messages. A display of the type “F:xx” indicates a failure. Refer to Table 30 on page 207 for a listing of display codes.

14 In the MAT/OTM “IP Telephony Gateway” main window, select **View | Refresh** and verify that the replacement ITG Line 2.1 card status is showing “Unequipped.”

End of Procedure

Verify ITG Line 2.1 card software and firmware

Procedure 40
Verifying ITG Line 2.1 card software and firmware

Note: Refer also to Procedure 15, “Verify card software and i2004 Internet Telephone firmware” on page 153.

1 Check the Meridian 1 ESD website for the latest recommended ITG Line 2.1 software and firmware release. The URL address is: “**http://www.nortelnetworks.com/servsup/esd/meridian1**”

The default user name is **usa**. The default password is **usa**. See your Nortel Network representative to register for a new default name and password if the default does not work.

2 Navigate through the site until you reach the Release Notes and associated software and firmware zip files. The Release Notes contain the latest versions of software and firmware. Make a note of this information to compare against the ITG Line 2.1 card.

3 In the "IP Telephony Gateway" window, double-click the replacement ITG Line 2.1 card to open the “Card Properties”.

4 Leave the default selection of the ITG Line 2.1 card in the "Card Properties" window, and click the “Configuration” tab.

5 Verify that the “S/W release” shows the latest recommended ITG Line 2.1 card software version. Verify the i2004 Internet Telephone firmware is the latest recommended release.

6 Upgrade the software and/or firmware if required. Refer to “Upgrade ITG Line card software from the web” on page 154 and “Upgrade i2004 Internet Telephone firmware” on page 157.

——— ***End of Procedure*** ———

Transmitting card properties

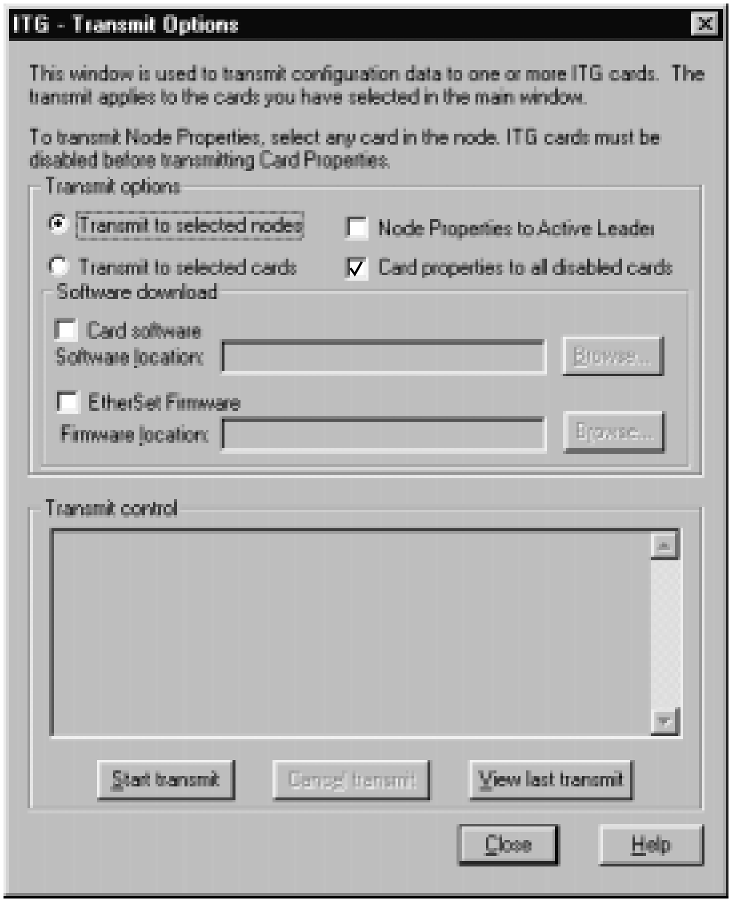
Procedure 41
Transmitting Card Properties

1 In the “IP Telephony Gateway” window, select the replacement ITG Line 2.1 card.

2 Click **Configuration** | **Synchronize** | **Transmit.**

3 The “ITG - Transmit Options” window appears (Figure 38).

Figure 38
ITG Transmit Options dialog box



4 Select the radio button “Transmit to selected cards”. Check the “Card properties" boxes only.

5 Click the **Start Transmit** button.

The transmission status is displayed in the “Transmit control” box. Confirm that Card Properties are transmitted successfully.

6 When the transmission is complete, click the **Close** button.

7 Use the Overlay 32 ENLC command to re-enable the ITG Line 2.1 card.

8 In the “IP Telephony Gateway” main window, select **View | Refresh**. The card status now shows “Enabled.”

9 Update the Installation Summary Sheet with the new MAC address.

10 Verify the TN, management interface MAC address and IP address for each ITG Line 2.1 card. Compare the displayed values with those on the ITG Installation Summary Sheet.

End of Procedure

Access the command line from MAT

Procedure 42
Telnet to an ITG Line 2.1 card

1 In the “MAT/OTM Navigator” window select the **ITG IP Phones** icon from the “Services” folder.

2 In the “IP Telephony Gateway - IP Phones” window click the right mouse button on the ITG Line 2.1 card that you wish to access and select **Card | Telnet to IP Telephony Gateway Line 2.0 card** from the popup menu.

3 Enter the default user name and password: **itgadmin**.

The MAT/OTM PC opens a Telnet window and automatically connects to the ITG Line 2.1 card by using the management IP address. After entering a username and password, the ITG shell command-line interface is accessed from the MAT/OTM PC.

End of Procedure

Adding a “dummy” node for retrieving and viewing ITG node configuration

Use this procedure to create a “dummy” ITG node for retrieving and viewing the actual ITG node configuration, without over-writing the existing ITG configuration data for an existing node in the MAT/OTM ITG database.

Retrieving the actual ITG node configuration to the “dummy” node is useful in the following cases:

- To isolate ITG node configuration faults
- To determine which copy of the database is correct, in order to determine the desired direction of database synchronization:
  - — transmit MAT/OTM ITG to ITG node, or
  - — retrieve ITG node to MAT/OTM ITG node.

The dummy node can be added manually or by retrieving the ITG node configuration data from an existing node.

The site name, Meridian/Succession CSE 1000 system name, and Meridian/Succession CSE 1000 customer number must exist in the MAT/OTM Navigator before you can add a new ITG node.

The following procedure is the recommended method to create the "dummy" ITG node.

Procedure 43
Creating the “dummy” ITG node to retrieve actual configuration:

1 In MAT/OTM Navigator add a site named “Retrieve ITG data.”

2 Add system named “Dummy,” of type “Meridian 1,” under the site named “Retrieve ITG data.”

3 Add Customer Number “99” on the “dummy” Meridian/Succession CSE 1000 system.

4 To view the actual data, select the “dummy” node and change the management IP address in the node properties to access the desired node.

5 Use the **Configuration|Synchronize|Retrieve** function to retrieve data from that node.

6 Confirm to over-write the MAT/OTM ITG data for the “dummy” node.

End of Procedure

Retrieving ITG configuration information from the ITG node

The following Procedure on page 219, is an optional procedure that may be used in the following cases:

- When adding an ITG node on MAT/OTM by retrieving an existing node
- When you suspect that the ITG node configuration on the ITG Line 2.1 card differs from the MAT/OTM ITG database (for example, during maintenance and fault isolation procedures).
- When you have multiple MAT/OTM ITG PCs with multiple instances of the database (administration).

Procedure 44
Retrieving ITG configuration data from the ITG node

1 Use the MAT/OTM ITG **Configuration|Synchronize|Retrieve** command to retrieve the ITG configuration information from the ITG node.

2 Launch the Meridian Administration Tools application on the MAT/OTM PC.

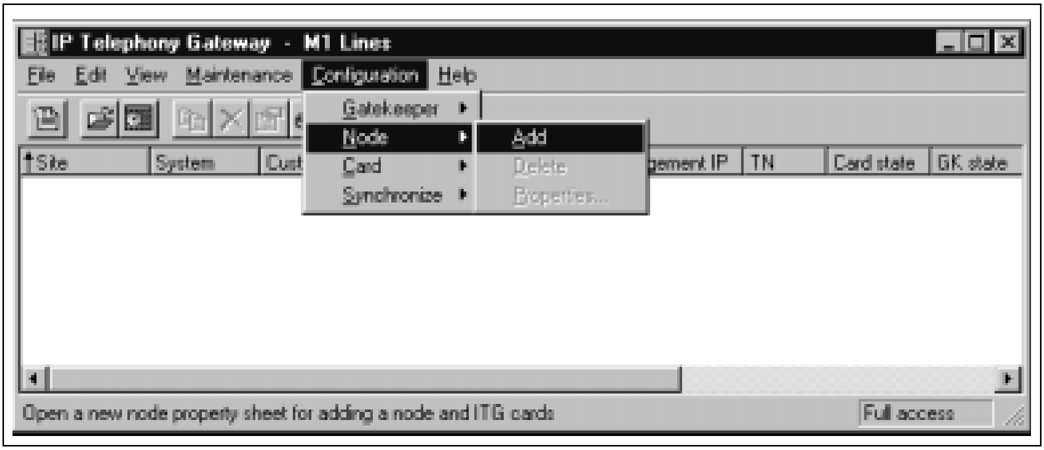
3 From the “MAT/OTM Navigator” window, double-click the **IP Telephony Gtwy** icon from the “Services” folder. The “IP Telephony Gateway” window opens.

4 In the “IP Telephony Gateway - M1 Lines” window, select Leader 0 or any card from the node.

5 In the “IP Telephony Gateway - M1 Lines” window, click the **Configuration** menu and select **Synchronize**, then **Retrieve.**

The “ITG - Retrieve Options” window appears.

Figure 39
ITG main window - Node Add



6 Leave the defaulted “Retrieve to selected nodes” option selected, or click the “Retrieve from selected cards,” depending upon the situation:

- **a** Leave the defaulted “Retrieve to selected nodes” when the MAT/OTM ITG data is out of date and you intend to synchronize all MAT/OTM ITG node data with the data from the ITG Line 2.1 cards on the node, or if you are adding a node on MAT/OTM by retrieving from an existing node that consists of more than one card.
- **b** Select “Retrieve from selected card” when you are attempting to isolate a problem with ITG configuration on a particular card.

7 Check the boxes for the ITG configuration data that you wish to retrieve, depending upon the situation:

- **a** Select “Node Properties,” "GK Properties" and “Card Properties,” if the MAT/OTM ITG data is out of date and you intend to synchronize all MAT/OTM ITG node data with the data from the ITG Line 2.1 cards on the node.
- **b** Select “Card Properties” if you are adding a node on MAT/OTM by retrieving from an existing node that consists of more than one card.
- **c** Select any combination of check boxes as indicated by problem symptoms when you are attempting to isolate a problem on a particular card. Use the “dummy” node for this purpose.

8 Click the **Start retrieve** button.

9 Monitor the progress of the retrieval in the “Retrieve control” box.

The retrieved “Node Properties,” "GK Properties" and “Card Properties,” will over-write the existing MAT/OTM ITG configuration data for the respective node or card.

The “Retrieving the ITG configuration information from the ITG node” procedure is complete.

End of Procedure

ITG Line 2.1/i2004 Internet Telephone maintenance and diagnostics - LD 32

The i2004 Internet Telephone, there are two kinds of TNs to consider:

- Physical TN, which represents a physical unit of the ITG Line 2.1 card
- Virtual TN, which is configured on a virtual superloop and represents an i2004 Internet Telephone

Physical TNs, that are seen as trunk units, are managed using existing LD 32 commands.

Because virtual TNs are configured on a virtual superloop, Virtual TN maintenance has no meaning. That is what is already provided by the Meridian/Succession CSE 1000 for phantom loops. In Overlay 32, any command affecting a phantom loop leads to an NTP665 message, since the loop does not physically exist. Overlay 32 supports STAT, DISU, ENLU and IDU commands on an i2004 Internet Telephone Virtual TN. All other commands lead to the new NPR047 message.

The IDU command provides the usual information, such as TN, TNID, NT code, color code, release code and serial number, as well as the IP address of the i2004 Internet Telephone and the IP address of the ITG Line 2.1 card that is acting as the terminal proxy. The serial number is the last three bytes of the i2004 Internet Telephone’s MAC address, printed in ASCII hex format.

Because Meridian/Succession CSE 1000 must request the information from the i2004 Internet Telephone, the IDU is effectively a "ping" command and can be used to test the end-to-end IP connectivity of the i2004 Internet Telephone. The output format of the IDU command in LD32 is shown in Table 32. This format only applies for i2004 Internet Telephone Virtual TNs. Table 33 contains the maintenance commands in LD32 for the i2004 Internet Telephone.

If the i2004 Internet Telephone is not registered with the Meridian/Succession CSE 1000, an NPR0048 message is generated. If the i2004 Internet Telephone is registered but idle, the system prints the i2004 Internet Telephone IP address and ITG Line 2.1 card IP address and generates an NPR0053 message.

Table 32
IDU command printout in LD 32

Item	Description
ISET TN:	l s c u
TN ID CODE:	I2004
NT CODE:	xxxxxx
COLOR CODE:	xx
RLS CODE:	xx
SER NUM:	xxxxxxx
SET IP ADR:	xxx.xxx.xxx.xxx
TPS IP ADR:	xxx.xxx.xxx.xxx

Table 33
LD 32 Maintenance Commands for the i2004 Internet Telephone

Prompt	Response	Description
STAT lscu STAT cu	UNEQ IDLE REGISTERED IDLE UNREGISTERED. BUSY, DSBL REGISTERED DSBL UNREGISTERED	Display the i2004 Internet Telephone state. UNEQ, IDLE, BUSY and DSBL have the usual meaning. IDLE and DSBL state are precise by the following information: • UNREGISTERED identifies an i2004 Internet Telephone that is configured in the system but that has not yet registered. • REGISTERED identifies an i2004 Internet Telephone that has registered.
DISU l s c u DISU cu	OK	Change the i2004 Internet Telephone state to DSBL. UNREGISTERED/REGISTERED state is not modified.
ENLU l s c u ENLU cu	OK	Change the i2004 Internet Telephone state to IDLE. UNREGISTERED/REGISTERED state is not modified.
IDU l s c u IDU cu	Displays the TN number, device code, NT code, color code, release code, last three bytes of MAC address. Displays the IP address for i2004 Internet Telephones and the Terminal Proxy Server.	Displays selected i2004 information.

ITG Line 2.1 shell commands

ITG Line 2.1 shell commands are designed to supplement overlay commands, and to introduce new features specific to the ITG platform.

The ITG Line 2.1 shell commands are accessed by connecting a TTY to the MAINT port on the ITG Line 2.1 card faceplate. Alternatively, the MAT/OTM ITG “Telnet” command can be used to access the ITG shell.

Commands are grouped into six categories:

- “General purpose commands:” on page 224
- “File transfer commands:” on page 226
- “IP configuration commands:” on page 228
- “Reset commands:” on page 229
- “DSP commands:” on page 229

The command line prompt is ITGL. Table 34 list the ITG shell commands applicable to the ITG Line 2.1 card.

Table 34
ITG Line 2.1 ITGL shell commands (Part 1 of 6)

ITGL>Command	Description
General purpose commands:	
itgCardShow	Displays card info.
itgMemShow	Displays memory usage
ifShow	Displays detailed IP information, including MAC addresses.
IPInfoShow	Displays IP information.
serialNumShow	Displays card serial number. This command displays the same ITG Line 2.1 card serial number that is displayed in the LD 32 IDC command.
firmwareVersionShow	Displays firmware version number.
numChannelsShow	Displays number of available channels.

Table 34
ITG Line 2.1 ITGL shell commands (Part 2 of 6)

ITGL>Command	Description
swVersionShow	Displays software version.
resetOM	Resets the operational measurement file timer. This command will reset all operational measurement parameters collected since last log dump.
logFileOn	Turns on error logging to the file.
logFileOff	Turns off error logging to the file.
logShow	Indicates whether logging is on or off.
logConsoleOn	Turns on error logging to the console.
logConsoleOff	Turns off error logging to the console
isetShow	Displays the general info for all the i2004 Internet Telephones that have registered, for example, IP address of the i2004 Internet Telephone, VTN that the i2004 Internet Telephone is associated with.
isetShowByTN	Show general information about all registered sets, sorted by TN.
isetShowByIP	Show general information about all registered sets, sorted by IP address.
pbxLinkShow	Display information about the link to the M1 CPU, including the configuration and link status.
itgAlarmTest	Generates **ITGxxxx** test alarms.
itsAlarmTest	Generates **ITSxxxx** test alarms.

Table 34
ITG Line 2.1 ITGL shell commands (Part 3 of 6)

ITGL>Command	Description
<u>**File transfer commands:**</u>	
swDownload "hostname", "username", "password", "directory path", "filename"	Updates the software on the ITG Line 2.1 card with the binary file received from an FTP server corresponding to the *hostname* IP address. The ITG Line 2.1 card ftp client performs a get which downloads the file to the ITG flash bank. A checksum is calculated to verify correct delivery. Once the new software version is successfully downloaded, the ITG Line 2.1 card must be rebooted with cardReset in order to run the new software. ***Note:*** *Hostname* refers to the either IP address of the FTP host, or the ITG Line 2.1 card itself or another ITG Line 2.1 card when a PC card in the A: drive of the ITG Line 2.1 card contains the software binary file.
Example:	ITGL>**swDownload** "47.82.32.346", "anonymous", "guest", "/software", "vxWorks.mms"
configFileGet "hostname", "username", "password", "directory path", "filename"	Updates the config.ini file on the ITG Line 2.1 card with the config.ini file on the specified host, account and path. The configFileGet task on the ITG host initiates an FTP session with the given parameters and downloads the file to flash file system. The config.ini file also contains the gatekeeper IP address, gateway password, and gateway DN-port mapping table.
Example:	ITGL> **configFileGet** "ngals042", "anonymous", "guest", "/configDir", "config.ini"
bootPFileGet "hostname", "username", "password", "directory path", "filename"	Updates the bootptab file on the ITG Line 2.1 card with the bootptab file on the specified host, account and path. The bootpFileGet task on the ITG host initiates an FTP session with the given parameters and downloads the file to flash file system.
Example:	ITGL> **bootPFileGet** "ngals042", "anonymous", "guest", "/bootpDir", "bootptab"

Table 34
ITG Line 2.1 ITGL shell commands (Part 4 of 6)

ITGL>Command	Description
hostFileGet "hostname", "username", "password", "directory path", "filename", "ITGFileName", listener	Gets any file from the host and does a Get via FTP to the ITG Line 2.1 card. ***Note:*** ITGFileName is the full path AND filename of where the file is to be placed. The listener parameter indicates which module to inform of the successful file transfer. It can be set to –1 to be disabled.
Example:	ITGL> **hostFileGet** "ngals042", "anonymous", "guest", "/hostfileDir", "hostFile.txt", "/C:ITGFILRDIR/ITGFILE.TXT", -1
currOMFilePut "hostname", "username", "password", "directory path", "filename"	The OMFilePut task on the ITG host initiates an FTP session with the given parameters and downloads the ITG Line 2.1 card's operational measurements file to the specified location on the host.
Example:	ITGL> **currOMFilePut** "ngals042", "anonymous", "guest", "/currDir", "omFile"
prevOMFilePut "hostname", "username", "password", "directory path", "filename"	The OMFilePut task on the ITG host initiates an FTP session with the given parameters and downloads the ITG Line 2.1 card's operational measurements file to the specified location on the host.
Example:	ITGL> **prevOMFilePut** "ngals042", "anonymous", "guest", "/prevDir", "omFile"
traceFilePut "hostname", "username", "password", "directory path", "filename"	The traceFilePut task on the ITG host initiates an FTP session with the given parameters and downloads the ITG Line 2.1 card's call trace file to the specified location on the host.
Example:	ITGL> **traceFilePut** "ngals042", "anonymous", "guest", "/trcDir", "trcFile"
LogFilePut "hostname", "username", "password", "directory path", "filename"	The LogFilePut task on the ITG host initiates an FTP session with the given parameters and downloads the ITG Line 2.1 card's logfile the to specified location on the host.
Example:	ITGL> **LogFilePut** "ngals042", "anonymous", "guest", "/currDir", "logFile"

Table 34
ITG Line 2.1 ITGL shell commands (Part 5 of 6)

ITGL>Command	Description
bootPFilePut "hostname", "username", "password", "directory path", "filename"	Sends the bootptab file from the ITG Line 2.1 card to MATMAT/OTM.
Example:	ITGL> **bootPFilePut** "ngals042", "anonymous", "guest", "/bootpDir", "bootpFile"
hostFilePut "hostname", "username", "password", "directory path", "filename", ITGFileName	Transfers any file from the ITG Line 2.1 card to the MAT/OTM PC.
Example:	ITGL> **hostFilePut** "ngals042", "anonymous", "guest", "/hostDir", "hostFile", "/C:/CONFIG/CONFIG1.INI"
<u>IP configuration commands</u>:	
NVRIPSet	Sets the IP address in NVRAM.
NVRGWSet	Sets the default gateway address in NVRAM.
NVRSMSet	Sets the subnet mask in NVRAM.
NVRIPShow	Prints the values of the IP parameters that reside in NVRAM.
nvramLeaderSet	Sets the leader bit in NVRAM.
nvramLeaderClr	Clears the leader bit in NVRAM, but does not erase the IP parameters in NVRAM.
NVRClear	Clear IP parameters in NVRAM.
setLeader	The one command that does all the necessary actions to make a leader. Sets IP address, gateway, subnet mask, boot method to static, and leader bit in NVRAM.
clearLeader	The one command that does all the necessary actions to clear the leader info in NVRAM and set the boot method to use bootp, thus, making the card a follower.

Table 34
ITG Line 2.1 ITGL shell commands (Part 6 of 6)

ITGL>Command	Description
Reset commands:	
cardReset	Performs a warm reboot of ITG Line 2.1 card. The card must be in the OOS state to use this command.
isetReset "tn" l s c u	- large systems (resets the i2004 Internet Telephone)
isetReset "tn" c u	- small systems (resets the i2004 Internet Telephone)
isetResetAll	Resets all registered i2004 Internet Telephones
ping "host", "numpackets"	This command sends an ICMP ECHO_REQUEST packet to a network host. The host matching the destination address in the packets will respond to the request. If a response is not returned, the sender will time out. This command is useful to determine if other hosts or ITG Line 2.1 cards are communicating with the sender card. The "numpackets" parameter specifies how many packets to send. If it is not included, ping runs until it is stopped by Ctrl-C (which also exits the ITGL shell). Example: ITGL>**ping** "47.82.33.123", 10
DSP commands:	
DSPReset	Resets the specified DSP
DSPSelfTest	Runs selftest on the DSP
DSPNumShow	Prints number of DSPs on ITG Line 2.1 card.
Upgrade commands:	
umsPolicyShow	Displays the current upgrade policy.
umsUpgradeAll	Upgrades all registered sets according to policy and firmware file.
umsUpgradeTimerShow	Shows upgrade schedule.
umsUpgradeTimerCancel	Cancels scheduled upgrade.

ITG Line 2.1 card selftests

During power-up, the ITG Line 2.1 card performs diagnostic tests to ensure correct operation. The faceplate RS-232 port on the ITG Line 2.1 card can be used to monitor the progress of these tests. When the 486 processor responds correctly, the 8051XA controller will switch its serial port to provide Card LAN communication and connect the 486 processor with the external RS-232 port.

Troubleshooting a software load failure

Symptoms

MAT/OTM cannot establish connection with ITG Line 2.1 card. The faceplate LCD display reads "BIOS."

Problem

The ITG Line 2.1 card has booted the BIOS load.

Diagnosis

In the event of a failure to load and run the ITG software, the ITG Line 2.1 card defaults to the BIOS load. This load consists of a prompt that allows commands to reload the ITG software and reboot (see below).

There are three known reasons that can cause the failure to load the ITG software:

- Not enough memory due to a faulty or missing SIMM.
- Corruption of the ITG software image in flash memory.
- The escape sequence to boot from the BIOS has been inadvertently sent down the serial line due to noise.

To determine which of the three causes caused the ITG load failure, reboot and monitor the booting sequence through the serial port. Capture the booting sequence to aid in communication with technical support personnel.

Examples of booting sequences:

Case 1: The following excerpt from the booting sequence indicates the amount of memory onboard.

Memory Configuration
Onboard: 4MB
SIMM: 16MB
Total: 20MB

In the absence or failure of the SIMM, the total memory is 4MB, which is not enough to support the ITG application.

Case 2: The following excerpt from the booting sequence indicates the ITG Line 2.0 card locating and loading the ITG software from flash memory:

Cookie array value: 0x111111100

Checksum Validation at Bank Address: 0xF9800000
Checksum in ROM = 35582602
Length of bank = 0004FEF8
Calculated Checksum = 35582602

Checksum array value: 0x11111100

Loading code from address: F9800010
Verifying ROM to RAM copy...
ROM to RAM copy completed OK
Jumping to VxWorks at 0x00E00000
EIP = 0x00E0011E
Jumping to romStart at 0x00E00300

In the event of a software load failure, the boot sequence indicates that the BIOS is being loaded:

Cookie array value: 0x11111111
Booting from BIOS ROM

Case 3: The boot sequence indicates that the "xxx" sequence has been entered and the BIOS is being loaded:

Solutions

Case 1: If a SIMM is missing, install a 16MB SIMM into the SIMM slot which is found underneath the ITG daugherboard. If the SIMM is present, check that the SIMM is properly seated. Otherwise, the SIMM is faulty and needs replacement.

Case 2: Re-attempt a software download from the MAT/OTM host. Use the following commands:

```
upgradeErase
upgrade "hostname","hostAccount","hostPassword",
    "hostDirectoryPath","hostSWFilename"
```

After the software loads to flash, reboot the card:

```
sysReboot
```

If the failure to load the ITG software into RAM persists, then the flash device is faulty. Replace the ITG Line 2.1 card.

Case 3: The escape sequence "xxx" is rarely transmitted. Reboot the card.

Warm rebooting the ITG Line 2.1 card

The following ITG shell command performs a warm reboot of an out-of-service ITG Line 2.1 card: **cardReset**

Test the ITG Line 2.1 card DSPs

At the ITG shell, the following two tests can be performed on the ITG DSPs:

- To run a selftest on the DSP daughterboard: **DSPselfTest**

  Note: If the DSP self test fails, the ITG Line 2.1 card must be replaced.

- To run a PCM loopback test, a Send loopback test, or a Receive loopback test on the DSP daughterboard, respectively:

DSPPcmLpbkTestOn ("DSPPcmLpbkTestOff" to stop the test)
DSPSndLpbkTestOn ("DSPSndLpbkTestOff" to stop the test)
DSPRcvLpbkTestOn ("DSPRcvLpbkTestOff" to stop the test)

Note: The DSPs and all associated ports must be disabled before performing these tests.

Work with alarm and log files

Alarm and log file output is turned on via the ITG shell. The following commands may be performed at the ITG shell prompt:

- to turn on/off the error log file, type: **logFileOn** or **logFileOff**.
- to display the modes of all log files/alarms, type: **logFileShow**.

Appendix A: I/O, maintenance and extender cable description

Contents

This section contains information on the following topics:

Overview

This appendix describes the NTMF94EA, NTAG81CA and NTAG81BA cables and explains how to replace the NT8D81BA backplane ribbon cable and install the NTCW84JA filter, if required.

NTMF94EA I/O cable

The NTMF94EA provides the E-LAN, T-LAN ports that provide the interface from the IP Line card to the customer's network equipment, and one DB9 serial port that provides serial connection between the card and the customer PC or TTY (see Figure 35). Table 36 describes the NTMF94EA cable pins.

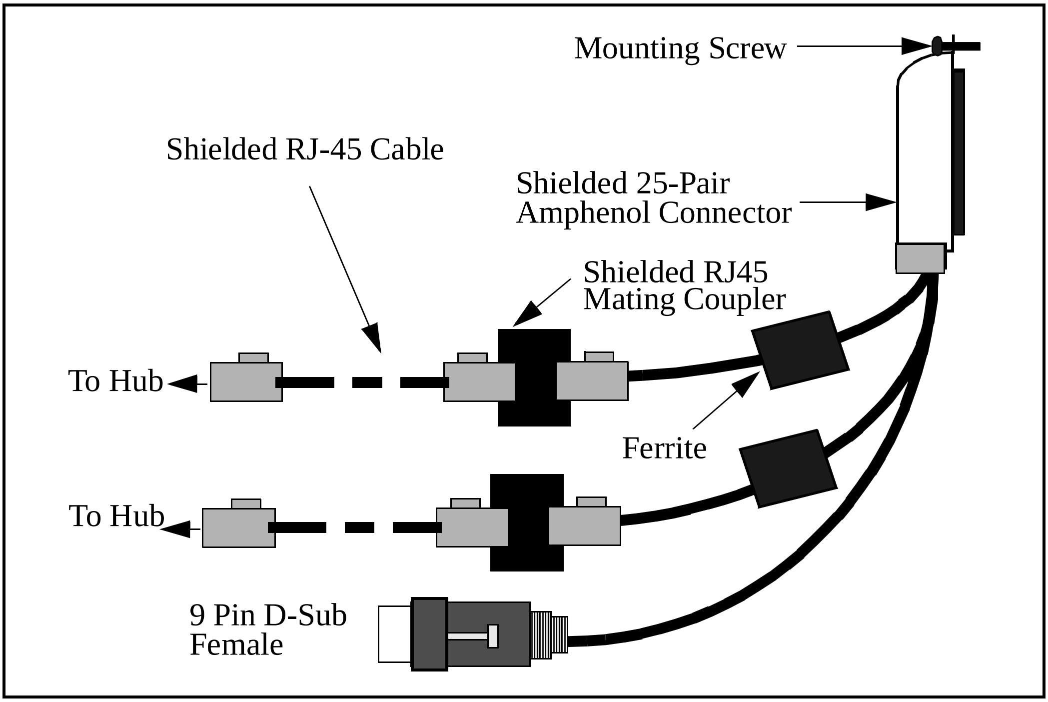
It is important to use the mounting screw provided to secure the top of the NTMF94EA cable 25-pair Amphenol connector to the Meridian/Succession Communication Server for Enterprise (CSE) 1000. The screw ties the LAN cable shield to the Meridian/Succession CSE 1000 frame ground for EMC compliance.

The NTMF94EA cable provides a factory installed, shielded, RJ45 to RJ45 coupler at the end of both the E-LAN and T-LAN ports. An unshielded coupler is provided to prevent ground loops (if required). Turn to page 241, to determine if you have to use the unshielded coupler. Both ends of the RJ45 ports of the cables are labeled as to which is the T-LAN and which is the E-LAN. The ports provide the connection point to the customer’s E-LAN and T-LAN equipment. You must use shielded Category 5 cable to connect to the customer’s equipment.

To improve EMC performance, use standard cable ties to bundle all LAN cables as they route out of the system.

> ***Note:*** To avoid damage to Category 5 cable, do not overtighten cable ties.

Table 35
NTMF94EA E-LAN, T-LAN and RS-232 Serial Maintenance I/O cable



Connector pin assignments

Table 36 shows the I/O connector pin designations for the Internet Telephony Gateway (ITG) Line 2.1 card.

Table 36
ITG Line 2.1 card I/O Panel Pinout (Part 1 of 2)

Pin	Normal Assignment	ITG Assignment	Pin	Normal Assignment	ITG Assignment
2	R1	Not Used	26	T0	Not Used
3	R2	Not Used	27	T1	Not Used
4	R3	Not Used	28	T2	Not Used
5	R4	Not Used	29	T3	Not Used
6	R5	AGND	30	T4	AGND
7	R6	Not Used	31	T5	Not Used
8	R7	Not Used	32	T6	Not Used
9	R8	Not Used	33	T7	Not Used
10	R9	AGND	34	T8	AGND
11	R10	PGT0	35	T9	PGT1
12	R11	PGT2	36	T10	PGT3
13	R12	PGT4	37	T11	PGT5
14	R13	PGT6	38	T12	PGT7
15	R14	PGT8	39	T13	PGT9
16	R15	PGT10	40	T14	PGT11

Table 36
ITG Line 2.1 card I/O Panel Pinout (Part 2 of 2)

Pin	Normal Assignment	ITG Assignment	Pin	Normal Assignment	ITG Assignment
17	R16	SGNDA	41	T15	BDCDA-
18	R17	BSINA-	42	T16	BSOUTA-
19	R18	BDTRA-	43	T17	SGND
20	R19	BDSRA-	44	T18	BRTSA-
21	R20	BCTSA-	45	T19	BSINB-
22	R21	BSOUTB-	46	T20	BDCDB-
23	R22	BDTRB-	47	T21	BDSRB-
24	R23	DI+	48	T22	DI-
25	no connect	DO+	49	T23	DO-
2	R1	no connect	50	no connect	no connect

Table 37
NTMF94EA cable pin description (Part 1 of 2)

I/O Panel: P1	Signal Name	P2, P3,P4	Color
P1-21	BSOUTB-	P2-2	RED
P1-22	BDTRB-	P2-4	GREEN
	SGRND	P2-5	BROWN
P1-45	BSINB-	P2-3	BLUE
P1-46	BDCDB-	P2-1	ORANGE
P1-47	BDSRB-	P2-6	YELLOW
P1-25	SHLD GRND		

Table 37
NTMF94EA cable pin description (Part 2 of 2)

I/O Panel: P1	Signal Name	P2, P3,P4	Color
P1-50	SHLD GRND		
P1-18	RXDB+	P4-3	GRN/WHT
P1-19	TXDB+	P4-1	ORG/WHT
P1-43	RXDB-	P4-6	WHT/GRN
P1-44	TXDB-	P4-2	WHT/ORG
P1-23	RX+	P3-3	GRN/WHT
P1-24	TX+	P3-1	ORG/WHT
P1-48	RX-	P3-6	WHT/GRN
P1-49	TX-	P3-2	WHT/ORG
P1-25	SHLD GRND		BARE
P1-50	SHLD GRND		BARE

Prevent ground loops on connection to external customer LAN equipment

The shielded RJ45 coupler is the connection point for the customer's shielded Category 5 LAN cable to the hub, switch, or router supporting the T-LAN and E-LAN. You must use shielded Category 5 RJ45 cable to connect to the customer's T-LAN/E-LAN equipment.

1 Connect the customer-provided shielded Category 5 LAN cable to the external LAN equipment. Ensure that the external LAN equipment is powered-up.

2 Use an ohmmeter to measure resistance to ground between the free end of the shielded RJ45 cable and building ground.

The ohmmeter *must* measure Open to ground before plugging it into the shielded RJ45 coupler on the end of the NTMF94EA.

3 If it does *not* measure Open, you must install the unshielded RJ45 coupler (provided) on the end of the NTMF94EA to prevent ground loops to external LAN equipment.

WARNING

The serial maintenance ports on the faceplate connector and the DB-9 female connector of the NTMF9DA cable assembly are identical. Do not connect a serial device to both access points simultaneously. This will result in incorrect and unpredictable operation of the IP Line card.

NTAG81CA maintenance cable description

You connect this cable between the 9-pin D-type RS232 input on a standard PC and the MAINT connector on the NT8R17AB faceplate or through the I/O cable serial port.

Figure 40
NTAG81CA Maintenance cable

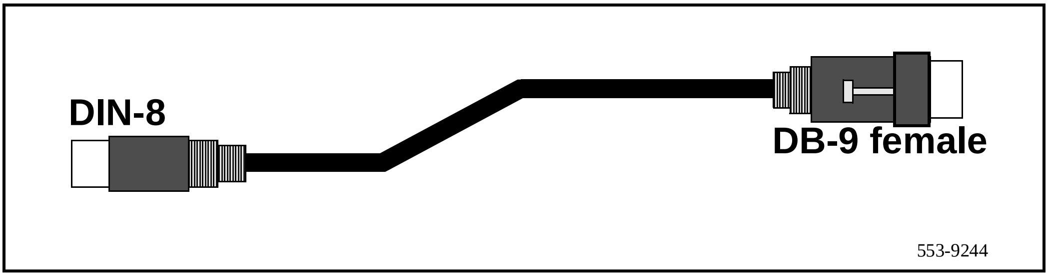


Table 38
NTAG81CA maintenance cable pin description

Signals (MIX Side)	8-pin Mini-DIN (MIX Side) Male	9-pin D-Sub (PC Side) Female	Signals (PC Side)
DTRB-	1	6	DSR-
SOUTB-	2	2	SIN-
SINB-	3	3	SOUT-
GND	4	5	GND
SINA-	5	nc	nc
CTSA-	6	nc	nc
SOUTA-	7	nc	nc
DTRA-	8	nc	nc

NTAG81BA Maintenance Extender Cable

The 3m cable connects the NTAG81CA cable to a PC or terminal. It has a 9-pin D-type connector at both ends, one male, one female. It can also be used to extend the serial port presented by the NTMF94EA I/O panel cable.

Figure 41
NTAG81BA Maintenance Extender cable

Table 39
NTAG81BA Maintenance cable pin description

9-pin D-Sub (Male)	9-pin D-Sub (Female)
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Replace cable NT8D81BA with NT8D81AA

This procedure explains how to replace the NT8D81BA cable with the NT8D81AA cable and how to install the NTCW84JA special IPE filter.

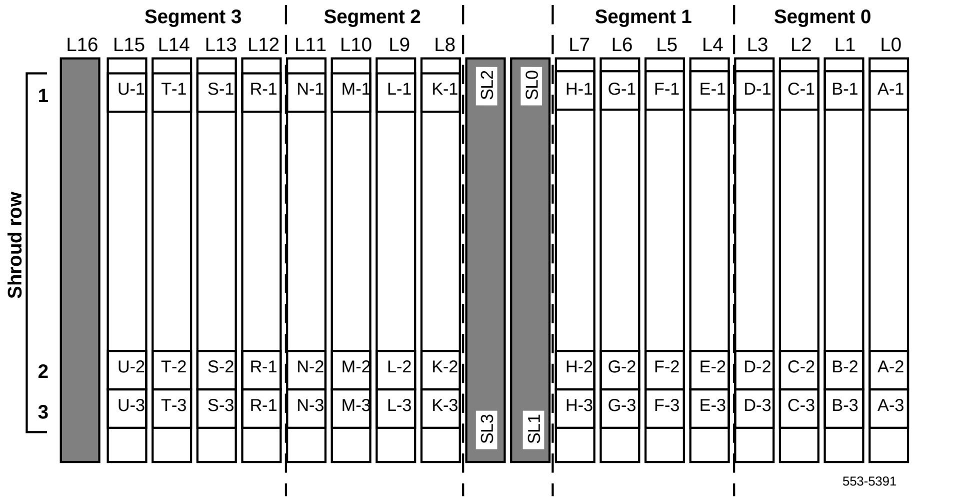
Cables are designated by the letter of the I/O panel cutout, such as A, B, and C, where the 50-pin cable connector is attached. Each cable has three 20-pin connectors (16 positions are used), designated 1, 2, and 3, that attach to the backplane. Using the designations described, the backplane ends of the first cable are referred to as A-1, A-2, and A-3. The locations of the cable connectors on the backplane are designated by the slot number (L0 through L9 for NT8D11, L0 through L15 for NT8D37) and the shroud row (1, 2, and 3). Using these designations, the slot positions in the first slot are referred to as L0-1, L0-2, and L0-3.

In NT8D37BA and NT8D37EC (and later vintage) IPE Modules, all 16 IPE card slots support 24-pair cable connections. Table 40 shows the cable connections from the backplane to the inside of the I/O panel. Figure 42 shows the designations for the backplane end of the cables, the backplane slot designations for the cable connections, and the associated network segments for the backplane slots.

Table 40
NT8D37 cable connections

Backplane slots–shroud rows	I/O panel/cable designation
L0–1, 2, 3	A
L1–1, 2, 3	B
L2–1, 2, 3	C
L3–1, 2, 3	D
L4–1, 2, 3	E
L5–1, 2, 3	F
L6–1, 2, 3	G
L7–1, 2, 3	H
L8–1, 2, 3	K
L9–1, 2, 3	L
L10–1, 2, 3	M
L11–1, 2, 3	N
L12–1, 2, 3	R
L13–1, 2, 3	S
L14–1, 2, 3	T
L15–1, 2, 3	U

Figure 42
Backplane slot designations



Tools list

- Ty-wrap cutter
- Ty-wraps
- Needle nose pliers
- Slotted screwdriver

Procedure 45
Removing an NT8D81BA cable

1 Identify the I/O panel and backplane designation that corresponds to the LEFT slot of the pair of card slots, viewed front the front, in which you installed the ITG ISL Trunk card.

2 Disconnect the filter from the I/O panel using screwdriver and needle nose pliers. Retain the fasteners.

3 Power down the IPE shelf.

4 Remove the IPE module I/O safety panel.

5 To remove the ribbon cables from IPE backplane:

Apply gentle pressure on the tab on the right side of the shroud while pulling on the connector until it pulls free from the shroud.

Remove connector 1 first, then remove connectors 2 and 3.

6 Discard NT8D81BA cable.

End of Procedure

Procedure 46
Installing an NTCW84JA filter and NT8D81AA cable

1 Install NTCW84JA special IPE filter connector in the vacant I/O panel slot using retained hardware.

2 Install NT8D81AA ribbon cable connectors in the IPE module backplane shroud. Be sure to install the connector so the label is facing right with the arrow pointing up and the connector is fully engaged into the shroud:

- **a** Install connector 1, (labeled UP1^) into backplane shroud 1.
- **b** Install connector 2, (labeled UP2^) into backplane shroud 2.
- **c** Install connector 3, (labeled UP3^) into backplane shroud 3.

3 Dress the ribbon cables back individually inside the rear of IPE module and restore the original arrangement. Start with the cables that are going to be underneath.

4 Attach NTCW84JA special IPE filter to NT8D81AA 50-pin connector using bail clips.

5 Restore power to the IPE module.

6 Replace the I/O safety panel.

End of Procedure

Appendix B: RM356 modem router

Contents

This section contains information on the following topics:

Overview

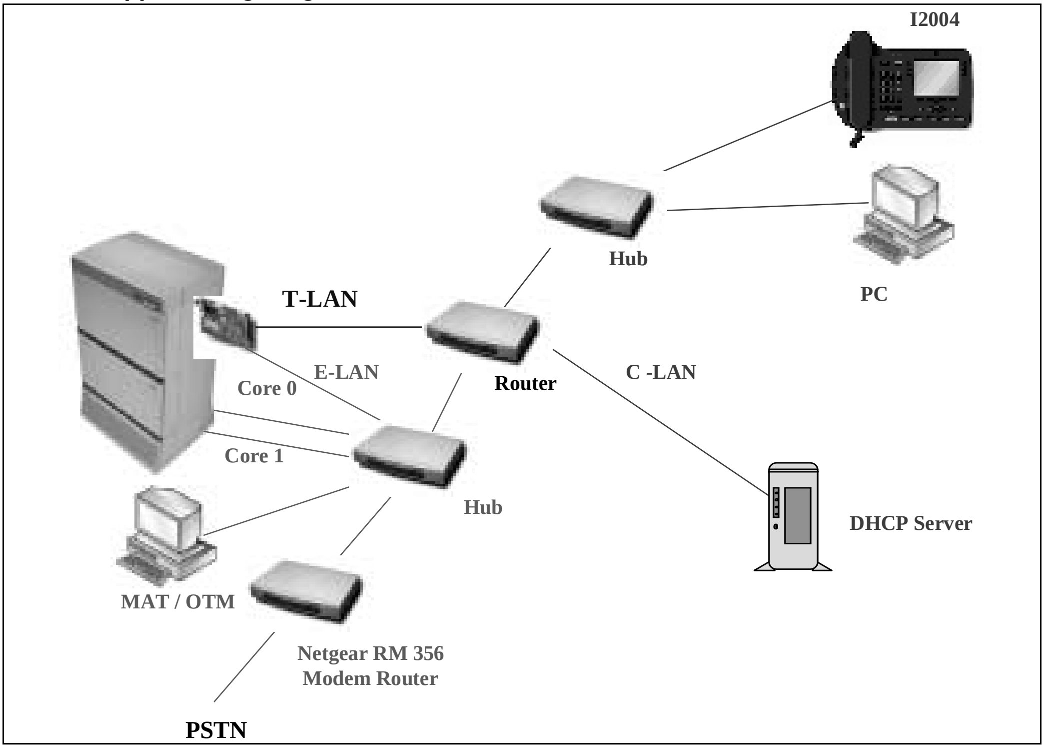
Management and support of the ITG network depend on IP networking protocols including SNMP, FTP, and Telnet. Install a modem router on the Meridian/Succession Communication Server for Enterprise (CSE) 1000 site LAN (called the embedded LAN or E-LAN as opposed to the customer's enterprise network or C-LAN) in order to provide remote support access for ITG and other IP-enabled Nortel Networks products.

The Netgear RM356 modem router integrates the functions of a V.90 modem, a PPP remote access server, an IP router, and a 4-port 10BaseT Ethernet hub, and provides a range of security features configured to comply with the customer's data network security policy. Do not install a modem router on the E-LAN without the explicit approval of the customer's IP network manager. The RM356 modem router is not secure unless it is configured correctly according to the customer's network security policy and practices. Figure 43 shows an example of a remote network.

RM356 modem router security features

- Password Authentication Protocol (PAP) for dial-in PPP connection.
- RM356 manager password.
- CLID for dial-in user authentication (requires C.O. line with Calling Line ID).
- Callback for dial-in user authentication.
- Dial-in user profiles
- Static IP routing
- IP Packet Filtering
- Idle timeout disconnect for dial-in PPP connection

Figure 43
Remote support using Netgear RM356 modem router



Install the RM356 modem router

Procedure 47
Installing the RM356 modem router

1 Place the modem router at a conveniently visible and physically secure location near an AC power outlet, an analog telephone line, and a 10BaseT Ethernet cable.

Up to four hosts or hubs can be connected to the integrated 10BaseT hub in the rear of the RM356 modem router.

2 Use shielded Cat5 10BaseT Ethernet cables to connect the modem router to the Management interface of up to four Internet Telephony Gateway (ITG) Line 2.1 cards. Other IP-enabled Nortel Networks products on the E-LAN can be connected to the RM356 modem router, including the Meridian 1 PBX, a local Meridian Administrative Tools (MAT) 6.6/Optivity Telephone Management (OTM) 1.0 PC, Symposium Call Center Server, and Call Pilot.

Note: The up-link connection to an additional E-LAN hub or optional C-LAN gateway requires either a cross-over 10BaseT Ethernet cable, or a special up-link port on the 10BaseT hub to which the RM356 is connected.

3 Connect the modem router to the AC power source. The power LED will light. After several seconds, the test LED flashes slowly four times, then stays off.

For each of the four 10BaseT ports on the integrated hub there is a link/data LED that is lit steadily to indicate a good received link (if a cable is connected to a host or hub), or flashing, to indicate data received on the LAN.

4 Connect the RJ45 plug end of the local manager cable to the RS232 Manager port RJ45 jack on the rear of the modem router.

5 Connect the other end of the manager cable to an RS232 terminal or PC COM port configured for the following communication parameters: 9600 bps, 8, none, and 1.

6 The local maintenance cable connects directly to data terminal equipment (DTE).

Note: The analog telephone line must be either a C.O. line or a PBX extension with a Direct Inward Dialing (DID) number, whichever complies with the customer's network security policy.

End of Procedure

Configure the RM356 modem router by the manager menu

This procedure can be performed from a terminal or PC connected to the local RS232 manager port on the rear of the modem router. Alternatively the manager menu can be accessed by Telnet after the IP addressing and routing have been set up initially from the local manager port.

Use the following keys in the RM356 manager menu:

- The arrow keys to navigate
- The spacebar key to toggle pre-defined configuration values for a field.
- The Enter key saves data changes to ROM and exits the current menu.
- The Esc key exits the current menu without saving changes.
- Enter menu selection number when prompted to display a sub-menu, configuration form, or command prompts.

Procedure 48
Configuring the RM356 modem router

1 From the terminal or manager menu, Press the **Enter** key.

The 'Enter Password:' prompt is displayed for 10 seconds.

2 Enter the default RM356 manager password: 1234

The "RM356 Main Menu" is displayed.

3 Enter menu selection number 1 to access "General Setup" under the "Getting Started" section of the "RM356 Main Menu."

"Menu 1 General Setup" is displayed.

4 Type in the system name (19 characters, no spaces), location, and contact person's name for the Meridian/Succession CSE 1000 site. Use the up and down arrow keys to move the cursor to the prompt "**Press ENTER to Confirm or ESC to Cancel:" at** the bottom of the menu. Press **Enter** to confirm and save data to ROM.

5 Enter menu selection number 2 under the "Getting Started" section.

"Menu 2: Modem" is displayed.

6 Type in modem name. Set "Active=Yes". Use arrow keys to navigate and space bar to toggle values. Set "Direction=Incoming". Type in the modem router's telephone number for reference. Press Enter to confirm and save data to ROM.

7 Enter menu selection number 3, "Ethernet Setup", under the "Getting started" section.

"Menu 3: Ethernet Setup" sub-menu is displayed.

8 Enter menu selection 2, "TCP/IP and DHCP Setup".

"Menu 3.2 - TCP/IP and DHCP Ethernet Setup" is displayed.

9 Use the space bar to toggle "DHCP=None".

10 Under "TCP/IP Setup", type in the IP address and the IP Subnet mask for the modem router's Ethernet interface on the E-LAN.

11 Toggle "RIP Direction=None". Press Enter to confirm and save data to ROM, then press Esc to return from the sub-menu to the main menu.

12 Enter menu selection number 12, "Static Routing Setup", under the "Advanced Applications" section.

"Menu 12 - Static Route Setup" sub-menu is displayed.

Note 1: If firewall security is properly configured in the customer's Management GW router, and if the modem router is permitted access over the C-LAN to other ITG nodes on remote E-LANs, define a default network route pointing to the Management GW IP address on the local E-LAN. Alternatively, define up to four different static network routes or host routes in the modem router to limit routing access from the modem router to the C-LAN.

Note 2: To prevent access from the modem router to the C-LAN via the Management GW router on the E-LAN, disable RIP by setting "RIP Direction=None", and remove all static routes or disable a particular static route by setting "Active=No".

13 Type in a descriptive route name, for example, "DefaultGW" (no spaces). Toggle "Active=Yes/No" for security purposes. The gateway IP address is the Management GW IP address on the E-LAN where the modem router is connected. " Press Enter to confirm and save data to ROM, then press Esc to return from the sub-menu to the main menu.

14 Enter menu selection number 13, "Default Dial-in Setup", under the "Advanced Applications" section.

"Menu 13 - Default Dial-in Setup " is displayed.

15 Enter menu selection number 1 to edit the first static route.

"Menu 12.1 - Edit IP Static Route" is displayed.

16 Under "Telco Options" toggle "CLIDAuthen=None/Preferred/Required".

CLID requires a C.O. line subscribed for CLID service where available. "Preferred" means some dial-in user profiles require CLID, but others do not. "Required" means no dial-in call is connected unless CLID is provided and user profiles require CLID for authentication.

Under "PPP Options" toggle "Recv Authen=PAP". Windows 9x Dial-up Networking (DUN) is not compatible with CHAP/PAP or CHAP on the modem router: calls are disconnected after a few minutes.

Toggle "Compression=No". Windows 9x DUN is not compatible with software compression on the modem router: calls are randomly disconnected.

Toggle "Mutual Authen=No".

Under "IP Address Supplied By:" Toggle "Dial-in User=No", "IP Pool=Yes". For "IP Start Addr=" type in the E-LAN IP address that will be assigned to the Dial-up Networking (DUN) PPP client on the remote MAT 6.6/OTM 1.0 PC.

Note: The remote MAT/OTM PC receives this E-LAN IP address whenever DUN makes a dial-in PPP connection to the modem router. As long as DUN remains connected to the modem router, IP applications on the remote MAT 6.6/OTM 1.0 PC function as if the PC were located on the customer's E-LAN.

Under "Session Options" configure input and output filter sets according to the customer's IP network security policy and practices. The default setting is no filter sets. Set "Idle Timeout=1200" seconds

to provide 20 minutes idle timeout disconnect for remote support purposes.Press Enter to confirm and save data to ROM.

17 Enter menu selection number 14, "Dial-in User Setup", under the "Advanced Applications" section.

"Menu 14 - Dial-in User Setup " is displayed.

Note: Up to eight dial-in user profiles can be defined according to the customer's network security policy.

18 Enter menu selection 1 to edit the first dial-in user profile.

"Menu 14.1 - Edit Dial-in User" is displayed.

19 Type in the user name. Toggle "Active=Yes/No" for security purposes. Type in a password for PAP. The DUN client on the remote MAT 6.6/ OTM 1.0 PC must provide the user name and password defined here when dialing up the modem router.

Set "Callback=Yes/No" according to the customer's network security policy and practices. Nortel Networks Customer Technical Services (CTS), does not currently accept Callback security calls from the modem router.

Set "Rem CLID=" to the PSTN Calling Number that is displayed when the remote MAT 6.6/OTM 1.0 PC dials up the modem router, if CLID authentication is required for the user profile. CLID depends on providing a C.O. line subscribed for CLID service for the modem router's telephone line connection.

Set "Idle Timeout=1200" seconds to provide 20 minutes idle timeout disconnect for Nortel Networks remote support purposes.

Press Enter to confirm and save data to ROM, then press Esc to return from the sub-menu to the main menu.

20 Enter menu selection number 23 to access "System Password" under the "Advanced Management" section of the "RM356 Main Menu."

"Menu 23 - System Password" is displayed.

21 Type in the old password and new password, then retype the new password to confirm. Never leave the RM356 system manager password defaulted to 1234 after the modem router has been installed and configured on the E-LAN. The modem router's security features are worthless if the manager password is not changed regularly according to good network security practices.

End of Procedure

RM356 modem router manager menu description

Application notes on Meridian/Succession CSE 1000 E-LAN installation

This section displays the various menus of the RM356 modem router:

```
                    RM356 Main Menu

Getting Started                        Advanced Management
  1. General Setup                   21. Filter Set Configuration
   2. MODEM Setup
   3. Ethernet Setup                   23. System Password
   4. Internet Access Setup            24. System Maintenance

Advanced Applications
   11. Remote Node Setup
   12. Static Routing Setup
   13. Default Dial-in Setup
   14. Dial-in User Setup                      99. Exit

              Enter Menu Selection Number:

                 Menu 1 - General Setup

            System Name= Room_304_RCH_Training_Center
            Location= Sherman Ave., Richardson, TX
          Contact Person's Name= John Smith, 972 555-1212
```

```
Press ENTER to Confirm or ESC to Cancel:

       Menu 2 - MODEM Setup

Modem Name= MODEM
Active= Yes
Direction= Incoming
Phone Number=
Advanced Setup= No
Press ENTER to Confirm or ESC to Cancel:

         Menu 3 - Ethernet Setup

1. General Setup
2. TCP/IP and DHCP Setup

      Enter Menu Selection Number:

    Menu 3.1 - General Ethernet Setup

Input Filter Sets= 2
Output Filter Sets=

Press ENTER to Confirm or ESC to Cancel:

Menu 3.2 - TCP/IP and DHCP Ethernet Setup

DHCP Setup:
  DHCP= None
  Client IP Pool Starting Address= N/A
  Size of Client IP Pool= N/A
  Primary DNS Server= N/A
  Secondary DNS Server= N/A

TCP/IP Setup:
```

```
          IP Address= 47.177.16.254
          IP Subnet Mask= 255.255.255.0
          RIP Direction= None
            Version= RIP-2B

        Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.


              Menu 12 - Static Route Setup

        1. DefaultGW
        2. ________
        3. ________
        4. ________

              Enter Menu Selection Number:

            Menu 12.1 - Edit IP Static Route

        Route #: 1
        Route Name= DefaultGW
        Active= Yes
        Destination IP Address= 0.0.0.0
        IP Subnet Mask= 0.0.0.0
        Gateway IP Address= 47.177.16.1
        Metric= 2
        Private= No

        Press ENTER to Confirm or ESC to Cancel:

             Menu 13 - Default Dial-in Setup

     Telco Options:                  IP Address Supplied By:
       CLID Authen= None                Dial-in User= No
```

```
                                         IP Pool= Yes
    PPP Options:                       IP Start Addr= 47.177.16.253
      Recv Authen= PAP
      Compression= No                    Session Options:
      Mutual Authen= No                    Input Filter Sets=
        PAP Login= N/A                     Output Filter Sets=
        PAP Password= N/A                  Idle Timeout= 1200

     Callback Budget Management:
      Allocated Budget(min)=
      Period(hr)=

                   Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

Menu 14 - Dial-in User Setup

```
                   1. itgadmin
                   2. ________
                   3. ________
                   4. ________
                   5. ________
                   6. ________
                   7. ________
                   8. ________

                         Enter Menu Selection Number:
```

Menu 14.1 - Edit Dial-in User

```
                   User Name= itgadmin
                   Active= Yes
                   Password= ********
                   Callback= No
                     Phone # Supplied by Caller= N/A
```

```
  Callback Phone #= N/A
Rem CLID=
Idle Timeout= 500

Press ENTER to Confirm or ESC to Cancel:
```

```
                 Menu 21 - Filter Set Configuration

 Filter                                 Filter
 Set #      Comments                    Set #      Comments
------  -----------------              ------  -----------------
   1      NetBEUI_WAN                     7      _______________
   2      NetBEUI_LAN                     8      _______________
   3      _______________                 9      _______________
   4      _______________                10      _______________
   5      _______________                11      _______________
   6      _______________                12      _______________

               Enter Filter Set Number to Configure= 0

               Edit Comments=

               Press ENTER to Confirm or ESC to Cancel:
```

```
                 Menu 21.1 - Filter Rules Summary

# A Type                Filter Rules                          M m n
- - ---- ----------------------------------------------- - - -
1 Y IP   Pr=17, SA=0.0.0.0, SP=137, DA=0.0.0.0            N D N
2 Y IP   Pr=17, SA=0.0.0.0, SP=138, DA=0.0.0.0            N D N
3 Y IP   Pr=17, SA=0.0.0.0, SP=139, DA=0.0.0.0            N D N
```

```
 4 Y IP   Pr=6, SA=0.0.0.0, SP=137, DA=0.0.0.0            N D N
 5 Y IP   Pr=6, SA=0.0.0.0, SP=138, DA=0.0.0.0            N D N
 6 Y IP   Pr=6, SA=0.0.0.0, SP=139, DA=0.0.0.0            N D F

                  Enter Filter Rule Number (1-6) to Configure:
```

Menu 23 - System Password

```
                    Old Password= ?
                    New Password= ?
                    Retype to confirm= ?

                     Enter here to CONFIRM or ESC to CANCEL:
```

Menu 24 - System Maintenance

```
                         1.  System Status
                         2.  Terminal Baud Rate
                         3.  Log and Trace
                         4.  Diagnostic
                         5.  Backup Configuration
                         6.  Restore Configuration
                         7.  Software Update
                         8.  Command Interpreter Mode
                         9.  Call Control

                          Enter Menu Selection Number:
```

Menu 24.1 -- System Maintenance - Status

```
Port Status   Speed  TXPkts  RXPkts  Errs  Tx B/s  Rx B/s   Up Time
 1    Idle    0Kbps   16206   12790    0       0       0    0:00:00

     Total Outcall Time:     0:00:00

     Ethernet:                   Name: Room_304_RCH_Traini
```

```
     Status:  10M/Half Duplex  RAS S/W Version: V2.13 | 9/25/98
    TX Pkts: 135579        Ethernet Address:00:a0:c5:e0:5b:a6
     RX Pkts: 662866
     Collisions: 49

   LAN Packet Which Triggered Last Call:

                                Press Command:

           COMMANDS: 1-Drop Port 1  9-Reset Counters   ESC-Exit
```

Menu 24.2 -- System Maintenance - Change Terminal Baud Rate

```
Terminal Baud Rate: 9600

                   Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

Menu 24.3 == System Maintenance - Log and Trace

```
                   1. View Error Log
                   2. Syslog and Accounting

                            Please enter selection:

  0     179754 PINI  INFO  SMT Session End
  1     179761 PP09  INFO  Password pass
  2     179761 PINI  INFO  SMT Session Begin
  3     179763 PINI  INFO  SMT Session End
  4     179772 PP09  INFO  Password pass
  5     179772 PINI  INFO  SMT Session Begin
  6     179775 PINI  INFO  SMT Session End
  7     179783 PP09  INFO  Password pass
  8     179783 PINI  INFO  SMT Session Begin
  9     179788 PINI  INFO  SMT Session End
 10     179796 PP09  INFO  Password pass
```

```
  11     179796 PINI  INFO  SMT Session Begin
  12     179798 PINI  INFO  SMT Session End
  13     179812 PP09  INFO  Password pass
  14     179812 PINI  INFO  SMT Session Begin
  15     179815 PINI  INFO  SMT Session End
  16     179830 PP09  INFO  Password pass
  17     179830 PINI  INFO  SMT Session Begin
  18     179834 PINI  INFO  SMT Session End
```

```
        Menu 24.3.2 -- System Maintenance - Syslog and Accounting

                 Syslog:
                 Active= No
                 Syslog IP Address= ?
                 Log Facility= Local 1

                 Press ENTER to Confirm or ESC to Cancel:

Press Space Bar to Toggle.
```

```
                 Menu 24.4 - System Maintenance - Diagnostic

     MODEM                                 System
       1.  Drop MODEM                        21. Reboot System
       2.  Reset MODEM                       22. Command Mode
       3.  Manual Call
       4.  Redirect to MODEM

     TCP/IP
       11. Internet Setup Test
       12. Ping Host

                       Enter Menu Selection Number:

                 Manual Call Remote Node= N/A
```

```
    Host IP Address= N/A

Menu 24.7 -- System Maintenance - Upload Firmware

    1. Load RAS Code
    2. Load ROM File

          Enter Menu Selection Number: 1
```

Appendix C: Product integrity

Contents

This section contains information on the following topics:

Overview

This chapter presents information about the Internet Telephony Gateway (ITG) Line 2.1 card reliability, environmental specifications, and electrical regulatory standards.

Reliability

Reliability is measured by the Mean Time Between Failures (MTBF).

Mean time between failures (MTBF)

The ITG Line 2.1 card Mean Time Between Failure (MTBF) is 46 years. Failures per 10^6 hours of operation are 2.483, based on 40 degrees C (140 degrees F).

Environmental specifications

Measurements of performance in regards to temperature and shock were made under test conditions as described in the following table.

Temperature-related conditions

Refer to Table 41 for a display of acceptable temperature and humidity ranges for the ITG Line 2.1 card.

Table 41
ITG Line 2.1 card environmental specifications

Specification	Minimum	Maximum
	Normal Operation	
Recommended	15° C	30° C
Relative humidity	20%	55% (non-condensing)
Absolute	10 ° C	45° C
Relative humidity	20% to	80% (non-condensing)
Short Term (less than 72 hr)	–40° C	70° C
Rate of change	Less than 1° C per 3 minutes	
	Storage	
Recommended	–20° C	60° C
Relative Humidity	5%	95% (non-condensing
	–40° C to 70° C, non-condensing	
	Temperature Shock	
In 3 minutes	–40° C	25° C
In 3 minutes	70° C	25° C
	-40° to 70° C, non-condensing	

Electrical regulatory standards

The following three tables list the safety and electro-magnetic compatibility regulatory standards for the ITG Line 2.1 card, listed by geographic region. Specifications for the ITG Line 2.1 card meet or exceed the standards listed in these regulations.

Safety

Table 42 provides a list of safety regulations met by the ITG Line 2.1 card, along with the type of regulation and the country/region covered by each regulation.

Table 42
Safety regulations

Regulation Identifier	Regulatory Agency
UL 1459	Safety, United States, CALA
CSA 22.2 225	Safety, Canada
EN 41003	Safety, International Telecom
EN 60950/IEC 950	Safety, International
BAKOM SR 784.103.12/4.1/1	EMC/Safety (Switzerland)
AS3260, TS001 - TS004, TS006	Safety/Network (Australia)
JATE	Safety/Network (Japan)

Electro-magnetic compatibility (EMC)

Table 43 lists Electro-magnetic emissions regulations met by the ITG Line 2.1 card, along with the country's standard that lists each regulation.

Table 43
Electro-Magnetic Emissions

Regulation Identifier	Regulatory Agency
FCC part 15 Class A	United States Radiated Emissions
CSA C108.8	Canada Radiated Emissions
EN50081-1	European Community Generic Emission Standard
EN55022/CISPR 22 CLASS B	Radiated Emissions (Basic Std.)
BAKOM SR 784.103.12/4.1/1	EMC/Safety (Switzerland)
SS-447-20-22	Sweden EMC standard
AS/NZS 3548	EMC (Australia/New Zealand)
NFC 98020	France EMC standard

Table 44 lists Electro-magnetic immunity regulations met by the ITG Line 2.1 card, along with the country's standard that lists each regulation.

Table 44
Electro-Magnetic Immunity

Regulation Identifier	Regulatory Agency
CISPR 22 Sec. 20 Class B	I/O conducted noise
IEC 801-2 (level 4)	ESD (Basic Standard)
IEC 801-3 (level 2)	Radiated Immunity (Basic Standard)
IEC 801-4 (level 3)	Fast transient/Burst Immunity (Basic Standard)
IEC 801-5 (level 4, preliminary)	Surge Immunity (Basic Standard)
IEC 801-6 (preliminary)	Conducted Disturbances (Basic Standard)
BAKOM SR 784.103.12/4.1/1	EMC/Safety (Switzerland)
SS-447-20-22	Sweden EMC standard
AS/NZS 3548	EMC (Australia/New Zealand)
NFC 98020	France EMC standard

Appendix D: Subnet mask conversion from CIDR to dotted decimal format

Overview

Subnet masks are expressed in Classless Inter Domain Routing (CIDR) format, appended to the IP address. For example 10.1.1.1/20. The subnet mask must be converted from CIDR format to dotted decimal format in order to configure IP addresses.

The CIDR format expresses the subnet mask as the number of bits counting from the most significant bit of the first IP address field. A complete IP address consists of 32 bits. Therefore, a typical CIDR format subnet mask will be in the range from /9 to /30. Each decimal number field in the dotted decimal format has a value from 0 to 255, where decimal 255 represents binary 1111 1111.

Procedure 49
Convert subnet mask from CIDR format to dotted decimal format

1 Divide the CIDR format value by 8. The quotient (the number of times that eight divides into the CIDR format value) equals the number of dotted decimal fields containing 255.

In the example above, the subnet mask is expressed as /20. Twenty divided by eight equals a quotient of two, with a remainder of four. Therefore, the first two fields of the subnet mask in dotted decimal format are 255.255.

2 If there is a remainder, refer to Table 45, to obtain the dotted decimal value for the field following the last field containing “255”. In the example of /20 above, the remainder is four. In Table 45, a remainder of four equals a binary value of 1111 0000 and the dotted decimal value of the next and last field is 240. Therefore the first three fields of the subnet mask are 255.255.240.

3 If there are any remaining fields in the dotted decimal format, they have a value of 0. Therefore, the complete subnet mask in dotted decimal format is 255.255.240.0.

End of Procedure

Table 45
CIDR format remainders

Remainder of CIDR format value divided by eight	Binary value	Dotted decimal value
1	1000 0000	128
2	1100 0000	192
3	1110 0000	224
4	1111 0000	240
5	1111 1000	248
6	1111 1100	252
7	1111 1110	254

Appendix E: ITG System Messages

Contents

This section contains information on the following topics:

ITG messages

ITG and ITS messages incorporate the severity category of the message in the first digit of the four digit number. Message numbers beginning with 0 do not follow this format.

where:

1 = Critical

2 = Major

3 = Minor

4 = Warning

5 = Cleared (Info)

6 = Indeterminate (Info)

All ITG and ITS error messages with a severity category of "Critical", are also displayed on the Internet Telephony Gateway (ITG) Line 2.1 card faceplate. Refer to "Faceplate maintenance display codes" on page 206 for further information.

ITG0100	Successful bootup. All alarms cleared.
ITG0101	Exit form QoS fallback. Normal operation restored.
ITG0102	Ethernet voice port restored to normal operation.
ITG0103	Ethernet management port restored to normal operation.
ITG0104	DSP successfully reset.
ITG0105	Exit from card fallback. Leader card restored.
ITG0150	D-channel restored. Channels restored to service.
ITG0200	Voice Ethernet buffer exceeded. Packet(s) discarded.
ITG0201	Management Ethernet buffer exceeded. Packet(s) discarded.
ITG0202	Card recovered from software reboot.
ITG0203	Fallback to PSTN activated.
ITG0204	DSP device reset.
ITG0206	Invalid A07 message received. Message discarded.
ITG0207	Unknown H.323 message received. Message discarded/rejected.
ITG0208	Backup leader has been activated.
ITG0250	Invalid X12 message received. Message discarded.
ITG0300	Memory allocation failure.
ITG0301	Channel not responding. Channel is disabled.
ITG0302	DSP device failure. Operating on reduced capacity.
ITG0303	DSP subsystem failure. Initiating card reboot.
ITG0304	Cannot write to file I/O write error.
ITG0305	Cannot open configuration file. Using default settings.
ITG0306	Meridian Messaging error threshold exceeded.
ITG0308	Address Translation failure. Call is released.

ITG0309	Unexpected DSP channel closed. Channel is unusable.
ITG0310	Cannot open DSP channel.
ITG0311	Unable to get response from Follower card.
ITG0312	Unable to push BOOTP tab file to backup leader.
ITG0313	Keycode failed validation. Configuration file discarded.
ITG0350	Gatekeeper RAS reject threshold exceeded.
ITG0351	Cannot open Gatekeeper configuration file. Using default settings.
ITG0400	Fatal self-test failure. Card is out of service.
ITG0401	Reboot threshold exceeded. Manual intervention required.
ITG0402	Ethernet voice port failure.
ITG0403	Ethernet management port failure.
ITG0404	Can’t open address translation file.
ITG0405	Keycode file failed validation during bootup.
ITG0406	Start-up memory allocation failure. Card reboot initiated.
ITG0407	Unable to get response from leader card.
ITG0408	Bad address translation file. Reverting to previous version (if any).
ITG0409	Bad configuration file. Reverting to previous version (if any).
ITG0410	Remote leader not responding.
ITG0411	Failed to start UDP server for intercard messaging. Card is in fallback.
ITG0412	Failed to start UDP client for intercard messaging. Card is in fallback.
ITG0413	Failed to register with Leader card. Defaulting to fallback mode.
ITG0414	No response from Leader card.
ITG0415	Task spawn failed. Attempting a reboot.
IITG0416	Failed to start QOS/Network Probing Timer.

ITG0417	Update to followers.
ITG0418	H-323 stack failed to initialize.
ITG0450	D-channel loss of signal. Associated channels busied out.
ITG0451	D-channel hardware failure. Associated channels busied out.
ITG0452	Meridian -1 messaging failure. Unable to process calls.
ITG0453	Cannot open Gateway DN file.
ITG0454	Cannot open Gatekeeper password file.
ITG0455	Bad Gatekeeper configuration file. Reverting to previous version if any.
ITG0456	Incorrect Gateway password. Calls to/from Gateway rejected by the Gatekeeper.
ITGx000	Card (re)booted, where x = 1-6
ITGx001	Task spawn failure <name>. where x = 1-6
ITGx002	Memory allocation failure. where x = 1-6
ITGx003	File IO error <operation> <object> <errno> <errtext>. where x = 1-6
ITGx004	Network IO error <operation> <object> <errno> <errtext>. where x = 1-6
ITGx005	Message queue error <operation> <object> <errno> <errtext>. where x = 1-6
ITGx006	Unexpected state encountered <file> <line> <state>. where x = 1-6
IITGx007	Unexpected message type <file> <line> <msg>. where x = 1-6
ITGx008	Null pointer encountered <file> <line> Name of pointer.

where x = 1-6

ITGx009 Invalid block <file> <line> Type of block.

where x = 1-6

ITGx010 Unable to locate data block <file> <line> Type of block.

where x = 1-6

ITGx011 Failed to push file <file> <host>.

where x = 1-6

ITGx012 Failed to retrieve file <file> <host>.

where x = 1-6

ITGx013 Voice ethernet receive buffer unavailable, packet(s) discarded.

where x = 1-6

ITGx014 Management ethernet receive buffer unavailable, packet(s), discarded.

where x = 1-6

ITGx015 Voice ethernet device failure.

where x = 1-6

ITGx016 Management ethernet device failure.

where x = 1-6

ITGx017 Invalid or unknown A07 SSD message <tn> <msg>.

where x = 1-6

ITGx018 Invalid or unknown X12 SSD message <tn> <msg>.

where x = 1-6

ITGx019 DSP channel open failure <channel>.

where x = 1-6

ITGx020 Configuration error <param> <value> <reason>.

where x = 1-6

ITGx021 DSP successfully reset <dsp>.

where x = 1-6

ITGx022	DSP channel not responding, channel disabled <channel>. where x = 1-6
ITGx023	DSP device failure, operating at reduced capacity <dsp>. where x = 1-6
ITGx024	DSP failure <dsp> <errno> <errtext>. where x = 1-6
ITGx025	DSP download failed retrying <dsp>. where x = 1-6
ITGx026	DSP download retry succeeded <dsp>. where x = 1-
ITGx027	DSP memory test timed out <dsp>. where x = 1-6
ITGx028	DSP memory test failed <dsp>. where x = 1-6
ITGx029	Error in DSP task <file> <line> <errno> <errtext>. where x = 1-6
ITGx030	Channel registration failure <channel> <errno> <errtext>. where x = 1-6
ITGx031	Allocation failure in DSP memory pool. where x = 1-6
ITGx032	Invalid codec number <codec>. where x = 1-6
ITGx033	Duplicate open attempt on channel <channel>. where x = 1-6
ITGx034	DSP channel send failure <channel>. where x = 1-6
ITGx035	Channel unexpectedly closed <channel>.

where x = 1-6

ITGx036 Encountered unexpected open channel, closed it <channel>.

where x = 1-6

ITS messages

ITS messages incorporate the severity category of the message in the first digit of the four digit number.

ITSx000 VTI function call timeout.

where x = 1-6

ITSx001 User terminal registration failed. <ip> <hwid> <errno> <errtext>.

where x = 1-6

ITSx002 Connect service activation error <reason>.

where x = 1-6

ITSx003 Duplicate master <node> <ip1> <ip2>.

where x = 1-6

ITSx004 Failed to retrieve node ID and TN <ip> <hwid>

where x = 1-6

ITSx005 Invalid node ID <ip> <hwid>.

where x = 1-6

ITSx006 Corrupted node ID/TN field <ip> <hwid>.

where x = 1-6

ITSx007 Received corrupted UNIStim message <message dump>.

where x = 1-6

ITSx008 Received unknown UNIStim message <message dump>.

where x = 1-6

ITSx009 RUDP connection lost: <ip>.

where x = 1-6

ITSx010 RUDP connection restarted: <ip>.

where x = 1-6

ITSx011 Communication link to M1 is down.

where x = 1-6

ITSx012 Communication link to M1 is up.

where x = 1-6

SCH messages

SCH1360 On the M3903 M3904 M3905 and i2004 sets key 17 is reserved for the TRN mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1361 On the M3903 M3904 M3905 and i2004 sets key 18 is reserved for the AO3 or AO6 mnemonic. No other mnemonic except NUL can be configured on that key. Info 9/17/98 0:00:00

SCH1362 On the M3903 M3904 M3905 and i2004 sets key 19 is reserved for the CFW mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1363 On the M3903 M3904 M3905 and i2004 sets key 20 is reserved for the RGA mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1364 On the M3903 M3904 M3905 and i2004 sets key 21 is reserved for PRK mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1365 On the M3903 M3904 M3905 and i2004 sets key 22 is reserved for the RNP mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1366 On the M3903 M3904 M3905 and i2004 sets key 23 is reserved for SCU/SCC/SSU or SSC. No other mnemonic except NUL can be configured on that key.

SCH1367 On the M3903 M3904 M3905 and i2004 sets key 24 is reserved for the PRS mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1368 On the M3903 M3904 M3905 and i2004 sets key 25 is reserved for the CHG mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1369 On the M3903 M3904 M3905 and i2004 sets key 26 is reserved for the CPN mnemonic. No other mnemonic except NUL can be configured on that key.

SCH1966 I2004 sets have to be defined on virtual superloops. Info 7/21/99 0:00:00

SCH1967 I2004 unit type only is allowed on virtual superloops.

SCH1968	Key 0 must be a DN key on an i2004 set (I.e. one of SCR SCN MCR MCN PLN PLR ACD DN).
SCH1970	Message Waiting Key (MWK) must be defined on key 16 on an i2004 set.

Appendix F: DHCP Supplementary Information

Contents

This section contains information on the following topics:

Introduction to DHCP

In order to understand how the i2004 Internet Telephone acquires the needed network configuration parameters automatically, the following section briefly describes the Dynamic Host Configuration Protocol (DHCP) protocol. It is recommended that readers, unfamiliar with the subject, read this section. Topics discussed will be helpful for the configuration and future maintenance of the DHCP server and ensure correct implementation with the i2004 Internet Telephone.

DHCP is an extension of BootP. Like BootP, it operates on the client-server model. Unlike BootP, DHCP has more message types. DHCP allows the dynamic allocation of IP addresses to different clients. It can be used to configure clients by supplying the network configuration parameters such as gateway or router IP addresses.

In addition, DHCP has a lease system that controls the duration an IP address is leased to a client. The client can request a specific lease length, or the administrator can determine the maximum lease length. A lease can range from one minute to 99 years. When the lease is up or released by the client the DHCP server automatically retrieves it and reassigns it to other clients if necessary. This is an efficient and accurate way to configure clients on the fly, saving the administrator from an otherwise repetitive task. In doing so, IP addresses can be shared among clients that do not require permanent IP addresses.

DHCP messages

There are seven different DHCP messages. Each message relates certain information between the client and server (see Table 2).

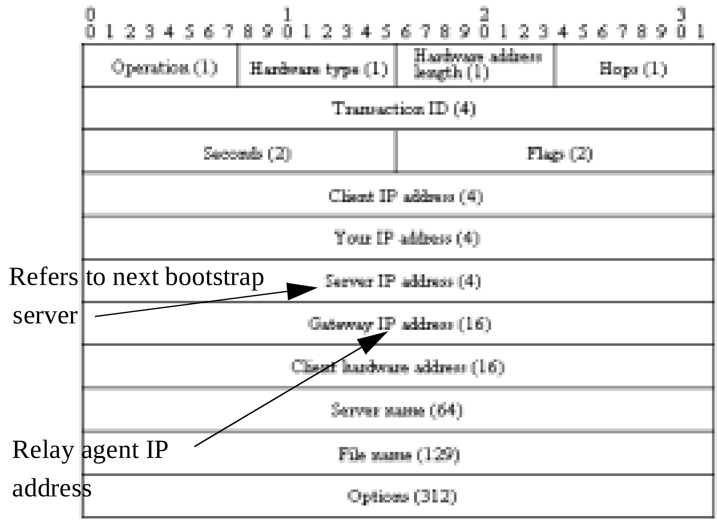
Table 46
DHCP message types

DHCP Message Types	Description
DHCPDISCOVER	Initiates a client request to all servers.
DHCPOFFER	Offer from server following client request.
DHCPREQUEST	Request a particular server for services.
DHCPAK	Notify client that requested parameters could be met.
DHCPNAK	Notify client that requested parameters could not be met.
DHCPDECLINE	Notify server that offer is unsatisfactory and will not be accepted.
DHCPRELEASE	Notify server that IP address is no longer needed.

DHCP Message Format

The DHCP message format shown in Figure 44 is common to all DHCP messages. Each message is made of 15 fields, 14 fixed-length fields and one variable length field. The fixed-length fields must be the specified number of bytes as indicated in the brackets. If there is not enough data, or there is no data at all, zeros are used to fill in the extra spaces.

Figure 44
DHCP message format



The Options field is the only field with a variable length. It is optional, but very important as it transports additional network configuration parameters. The DHCP options are the actual subfields that are used in this project.

DHCP Message Exchange

For a client to receive services from a DHCP server, an exchange of DHCP messages between the client and server must take place. The sequence and types of DHCP message exchanged can differ, but the mechanism of acquiring and supplying information remains the same.

Usually the client initiates the exchange with a DHCP message broadcast. Using a broadcast allows the client to send messages to all the servers on the network without having an associated IP address. The broadcast is local to the LAN unless a DHCP relay agent is present to forward the packet.

At this point, the client has no information about the server or the IP address it is going to receive (unless it is requesting a renewal), so the fields in the DHCP message are empty. However, the client knows its own MAC address and includes it in the Client hardware address field. The client may also have a list of parameters it would like to acquire and can request them from the DHCP server by including the Parameter Request List option (Option Code 55) in the DHCPDISCOVER message.

When the DHCP server sees the broadcast, it responds by broadcasting its own DHCP message. The server, since it knows more about the network, is able to fill in most of the information in the message. For example, information such as server IP address and gateway IP address are included in their respective fields. Since the client does not have an IP address yet, the server uses the client's MAC address to uniquely identify it. When the client sees the broadcast, it matches its MAC address against the one in the message.

Using this method, the server and client can supply or receive information through the exchange of their DHCP messages.

DHCP Options

DHCP Options are the sub fields of the Options field. They carry additional network configuration information requested by the client such as IP address lease length and subnet mask.

Each DHCP option has an associated option code and a format for carrying data. Usually the format is as follows:

Option code Length Data

There are two categories of DHCP options, standard and non-standard. The standard options are predefined by the industry while non-standard options are user-defined to fit the needs of a particular vendor or site.

There are a total of 255 DHCP option codes where option codes 0 and 255 are reserved, 1-77 are predefined, 1-254 can be used for Vendor Specific options and 128-254 are designated for Site Specific options. This arrangement allows for future expansion and is to be used as a guideline for choosing option codes.

Vendor Specific/Encapsulated Option

The Vendor Specific DHCP options are vendor-defined options for carrying vendor-related information. It is possible to override predefined standard options but doing so can cause conflict when used with components that follow the industry standard.

A useful option is the standard Vendor Encapsulated option - code 43. It is used to encapsulate other DHCP options as sub-options. For example, Nortel Network's i2004 Internet Telephone requires vendor specific Internet Telephony Gateway (ITG) Line 2.1 card information. The vendor, Nortel Networks, decided to carry this information in one of several Site Specific options and then encapsulate it into option 43. Since the information is specific to a Nortel Networks product, it is vendor specific. Once encapsulated, the information appears as one or more sub options inside option 43, which the i2004 Internet Telephone decodes.

Site Specific Option

Another way to transport the ITG Line 2.1 card information is through Site Specific options. These are unused DHCP options that have not been predefined to carry standard information. Unlike the Vendor Specific options, the information transported is "site" specific and option codes 128-254 are used for encoding.

For Nortel Network's i2004 Internet Telephone, ITG Line 2.1 card information involves the location of the ITG Line 2.1 card in the network. This varies for different sites and can be implemented in a Site Specific option. If the Vendor Encapsulation option is used, the information will have to first be encoded in a Site Specific option. Nortel Networks has provided a list of five possible Site Specific option codes to implement the ITG Line 2.1 card information. Only one of the five codes needs to be implemented to carry the information, but the choice is to offset the possibility that the option code chosen has been used for other purposes.

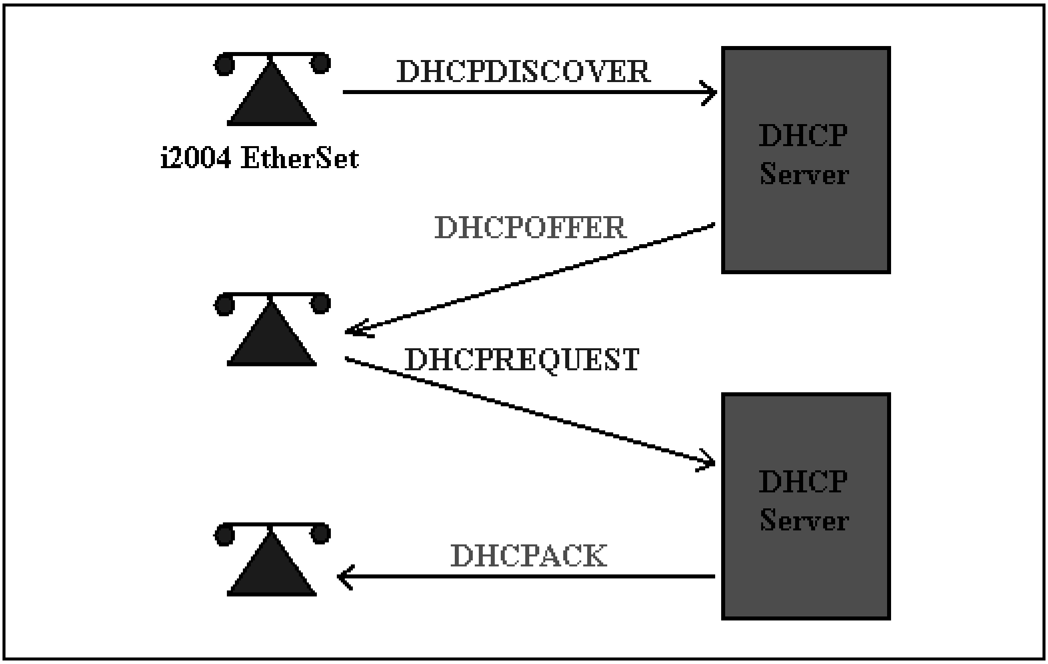
IP Acquisition Sequence

This section focuses on the mechanics and sequence of the DHCP message exchange as the i2004 Internet Telephone uses DHCP for IP acquisition. Although the i2004 Internet Telephone requests many network configuration parameters as well as an IP address, the following cases focus on the concept of "how" instead of "what" information is acquired. Also, the i2004 Internet Telephone is used as the sample client but most of the illustrations apply to other DHCP clients as well.

Case 1

Case 1 is a typical situation where the i2004 Internet Telephone requests services from a DHCP server. This is illustrated in Figure 45 and explained below.

Figure 45
IP Acquisition Phase - Case 1



1 The i2004 Internet Telephone initiates the sequence by broadcasting a DHCPDISCOVER message.

2 A DHCP server on the network sees the broadcast, reads the message, and records the MAC address of the client.

3 It checks its own IP address pool(s) for an available IP address and broadcasts a DHCPOFFER message if one is available. (Usually the server ARPs or PINGs the IP address to make sure it is not being used.)

4. The i2004 Internet Telephone sees the broadcast and after matching its MAC address with the offer, reads the rest of the message to find out what else is being offered.
5. If the offer is acceptable, it sends out a DHCPREQUEST message with the DHCP server's IP address in the Server IP address field.
6. The DCHP server will match the IP address in the Server IP address field against its own to find out who the packet belongs to.
7. If the IPs match and there is no problem supplying the requested information, it assigns the IP address to the client by sending a DHCPACK.
8. If the final offer is not rejected, the IP acquisition sequence is complete.

Case 2

The IP acquisition becomes unsuccessful if either the server or the client decides not to participate.

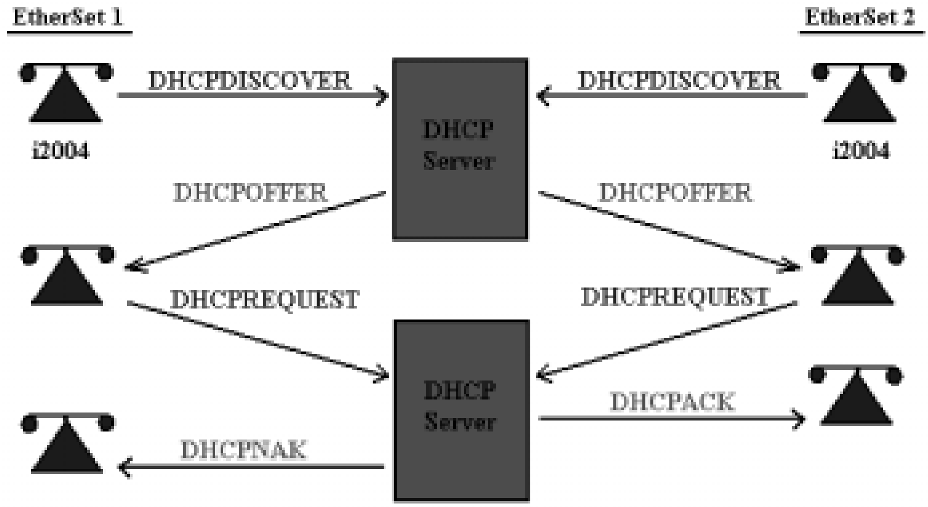
If the DHCP server cannot supply the requested information:

- It sends a DHCPNAK message and no IP address is assigned to the client. This can happen if the requested IP address has already been assigned to a different client (see Figure 46 on page 291).

If the Client decides to reject the final offer (after the server sends a DHCPACK message):

- the Client sends a DHCPDECLINE message to the server, telling it the offer is rejected.
- the Client will have to restart the IP acquisition by sending another DHCPDISCOVER message, in search of another offer.

Figure 46
IP Acquisition Sequence - Case 2



Case 3

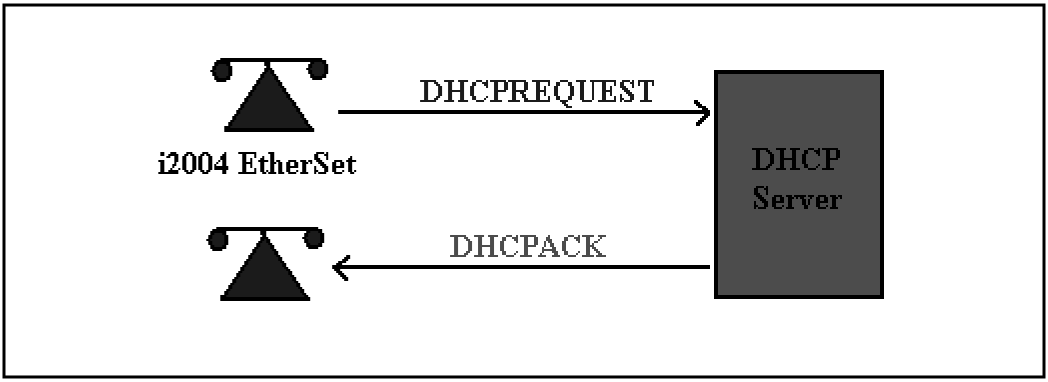
Finally, when a client is finished with a particular IP address, it sends a DHCPRELEASE message to the server which reclaims the IP address. If the client requires the same IP address again, it can initiate the process as follows:

1 i2004 Internet Telephone broadcasts a DHCPREQUEST to a particular DHCP server by including the server's IP address in the Server IP Address field of the message. Since it knows which IP address it wants, it requests it in the DHCP message.

2 The DHCP server sends a DHCPACK message if all the parameters requested are met.

Case 1 is similar to Case 3, except the first two messages have been eliminated. This reduces the amount of traffic produced on the network (see Figure 47).

Figure 47
IP Acquisition sequence - Case 3



Multiple DHCPOFFERS

In some networks, if more than one DHCP server is present, a client can receive multiple DHCPOFFER messages. Under these situations, the IP acquisition sequence depends on the client. The client can wait for multiple offers, or just go with the first offer it receives. If it accepts multiple offers, it compares them before choosing one with the most fitting configuration parameters. When a decision is made, the message exchange is the same as if there is only one DHCP server and proceeds as in the previous Cases. The servers that have not been chosen to provide the service do not participate in the exchange.

The i2004 Internet Telephone only responds to DHCPOFFERs, that have the same unique string identifier, "Nortel-i2004-A" as the i2004 Internet Telephone. This string must appear in the beginning of the list of ITG Line 2.1 card parameters. Without this string, the i2004 Internet Telephone does not accept the DHPCOFFER, even if all parameters requested and ITG Line 2.1 card information are present. If no valid DHCPOFFERs are sent then, the i2004 Internet Telephone keeps broadcasting in search of a valid offer.

With multiple DHCP servers on the same network, a problem can occur if any two of the servers have overlapping IP address range and no redundancy. DHCP redundancy is a property of DHCP servers, which allows different DHCP servers to serve the same IP address ranges simultaneously. Administrators must be aware that not all DHCP servers have this capability.

i2004 support for DHCP

DHCP support in the i2004 Internet Telephone includes sending a Class Identifier option with the value "Nortel-i2004-A" in each DHCP Discovery and Request. Additionally, the i2004 checks for either a Vendor Specific option message with a specific, unique to Nortel i2004, encapsulated sub-type, or a Site Specific DHCP option. In either case, an i2004 Internet Telephone specific option must be returned by the i2004-aware DHCP server in all DHCPOFFER and DHCPACK messages. The i2004 Internet Telephone uses the information returned in this option to configure itself for proper operation. This includes binding a new IP address, netmask and default gateway (for local IP stack) as well as configuring the primary bootstrap server and optional secondary server.

Appendix G: Setup and Configuration of DHCP Servers

Contents

Installing a WinNT 4 server

To set-up the WinNT 4 server, follow the instructions provided in the installation booklet. After completion, install Service Pack 3 and make sure the DHCP Manager is included.

IMPORTANT

If you are installing a WinNT 4 server with Service Pack 4 or later, follow the installation instructions included with your server hardware.

Configuring a WinNT 4 with DHCP

Configure a WinNT 4 server with DHCP services using the GUI provided.

Procedure 50
Launching the DHCP Manager

1 Click on the Windows **Start menu button** as shown in Figure 48 on page 297.

2 Select **Programs.**

3 Select **Administrative tools (common).**

The **DHCP Manager** window opens.

4 Double click on Local Machines on the left panel.

The **Create Scope (Local)** window opens.

5 Create and then fill in the information (See Figure 49 on page 298).

6 Click OK when finished.

7 In the DHCP Manager (Local) window, highlight the scope that will serve the i2004 clients.

8 From the **DHCP Options** menu, select ’Default Values**”.**

9 Click on the “**New**” button. (See Figure 50 on page 299).

10 Fill in the information and click OK when finished.

11 From the DHCP Manager window, highlight the scope to which you want to add DHCP options.

12 From the **DHCP Options** menu, select **Scope.**

The DHCP Options Scope window opens.

13 Chose standard DHCP options from the left panel and add them to the right panel, as shown in Figure 51 on page page 300.

14 Edit the default value using the Edit Array Button

15 From the DHCP Manager (Local) window, highlight the scope that needs to be activated.

16 From the **DHCP Options** menu, select **Scope.**

The DHCP Options Scope window opens.

17 Click on the “**Activate” button**.

18 The light bulb next to the scope should turn yellow as in Figure 52 on page 301.

Figure 48
Windows NT server screen

Figure 49
Defining a new scope

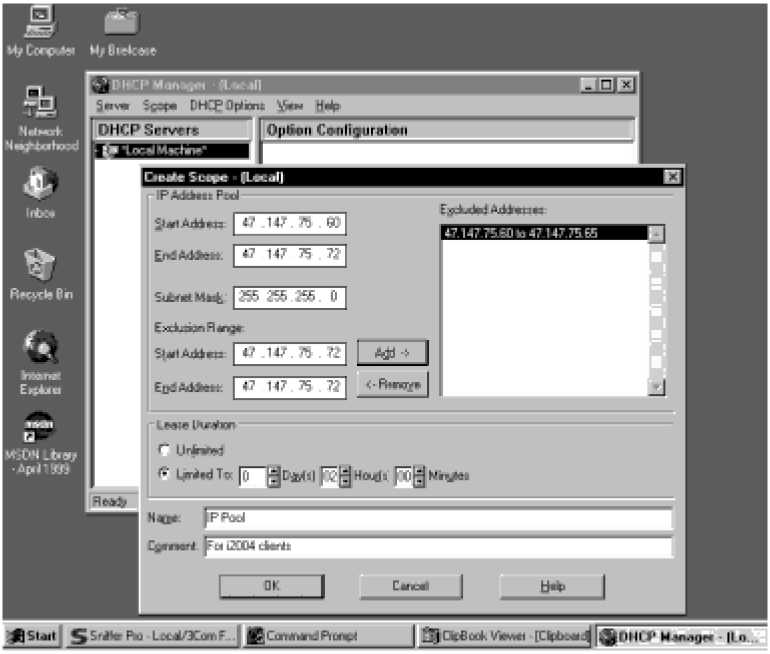


Figure 50
Defining the Nortel-specific option

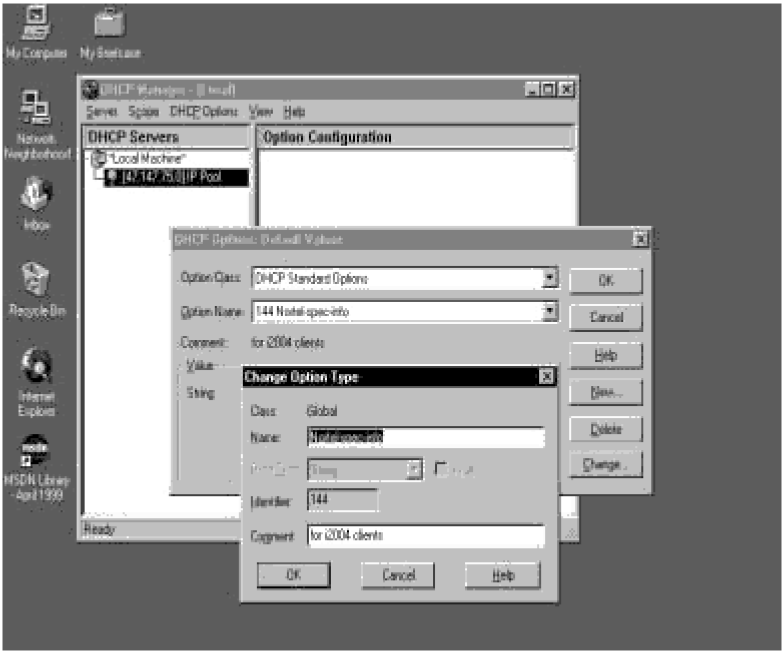
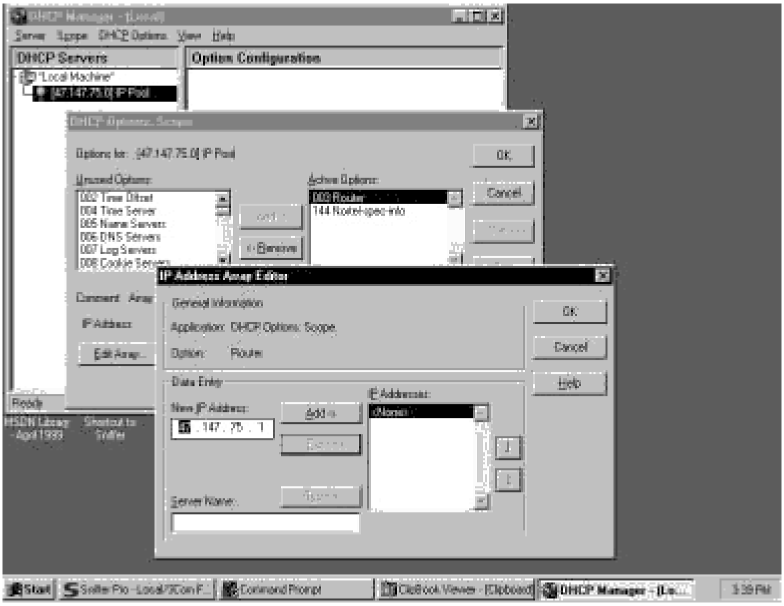
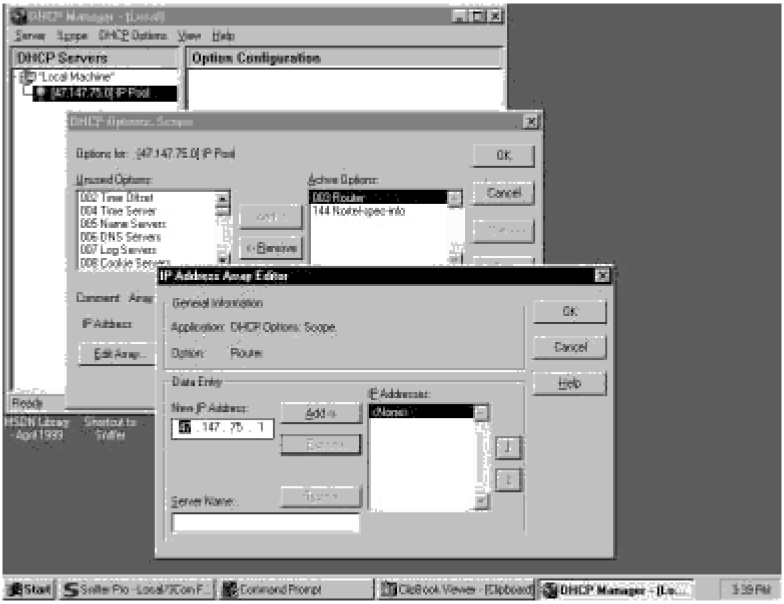


Figure 51
Adding standard DHCP options to scope



—————— End of Procedure ——————

Figure 52
Activating the scope



Installing ISC's DHCP Server

To set-up ISC's DHCP server, read the README file and follow the instructions on how to compile, make and build the server. Once set-up is complete, configure the server by following the description in the next section.

CAUTION

Although, WinNT 4 also has the Vendor Encapsulation Option (option code 43), do not use it to encode the Internet Telephony Gateway (ITG) Line 2.1 card information needed by the i2004. This is because WinNT 4 only allows 16 bytes of data to be encapsulated which is not enough to encode all the information needed.

WinNT 4's DHCP server will transmit any user-defined option associated within a scope if the client requests it. It does not have the ability to distinguish among different types of client, hence cannot make decisions based on this information. This makes it impossible to create client specific IP address pool/scope.

Configuring ISC's DHCP Server

To configure ISC's DHCP server, a text based configuration process is used. Configuration is done by adding definitions and declarations in the dhcpd.conf file located at /etc/. Various man files are provided on how to configure the server, the lease system, using options and conditions, and running the server. Obtain the dhcpd.conf.man5 file in the server directory and read it carefully. It provides explanations on relevant topics as well as location of other man files to read for additional information.

Configuring ISC's DHCP to work with the i2004 telephone

Use Procedure 51 on page 303 to configure the ISC's DHCP to work with the i2004 telephone.

There is a particular format for encoding the ITG Line 2.1 card information. In addition to the configuration statements provided, other network and subnet declarations must also be included in the configuration file. As mentioned in the beginning of this section, read the "man" files and use Example 1 on page 304 to configure ISC's DHCP server to work with the i2004. Also a copy of the configuration file used for this project, is provided at the end of this section.

Procedure 51
Configuring ISC's DHCP server

1 Configure the server to identify a client correctly as the i2004 EtherSet. This is done using a **match** statement with a conditional **if** enclosed inside a **class** declaration, as follows:

```
class "i2004-clients"{

 match if option vendor-class-identifier =
4e:6f:72:74:65:6c:2d:69:32:30:30:34:2d:41:00;}
```

The Hex string represents the text string "Nortel-i2004-A". If the vendor-class-identifier obtained from the client's DHCPDISCOVER message match this Hex-encoded string, then the server adds this client to the "i2004-clients" class. Once a client is classified as a member of a class it must follow the rules of the class.

2 Declare a pool of IP addresses exclusively for the members of the "i2004-clients" class. The pool declaration is used to group a range of IP addresses together with options and parameters that apply only to the pool.

3 Restrict access to the pool. Use the **allow** or **deny** statement to include or exclude the members of a particular class. For example, the follow configuration code allows only members of "i2004-clients" to use this IP address pool:

```
pool{

    allow members of "i2004-clients";

    range 47.147.75.60 47.147.75.65;

    option routers 47.147.75.1;


    # Nortel Networks special string

option vendor-encapsulated-options 80:3d:4e:6f:72:…;}
```

Note: If a client is not a member of this class, it will not be assigned an IP address from this pool even if there were no other available IP addresses.

4 The DHCPOFFER from the ISC server must include the ITG Line 2.1 card information if the client is an i2004 set. There are two methods to encode the necessary information for the i2004 client:

a Use the **vendor-encapsulated-options** option (as in the previous example) to encode the information as a sub option.

b Define a **Site Specific option** to carry the necessary information. To define a site specific option:

- give a declaration in the form of name of the option, the option code and the type of data it carries outside any pool or network declarations. For example:

  option nortel-specific-info code 144 = string;

- replace the vendor-encapsulated option inside the pool statement with the definition,

  option nortel-specific-info = “Nortel …”;

End of Procedure

Configuration file

There is a particular format for encoding the ITG Line 2.1 card information. In addition to the configuration statements provided, other network and subnet declarations must also be included in the configuration file. As mentioned in the beginning of this section, read the man files and use the following example as a guideline:

 # File name: dhcpd.conf

 # Location: /etc/

 # Description: Configuration file for ISC dhcpd server

 # Author: Cecilia Mok

 # Date: September 24, 1999

Global option definitions common for all supported networks...

```
default-lease-time 300;

max-lease-time 7200;

option subnet-mask 255.255.255.0;

option broadcast-address 255.255.255.255;


# Defining nortel-specific option for i2004 client

option my-vendor-specific-info code 144 = string;


# Declaring a class for i2004 clients.

# Add new clients to the class if their Class Identifier match the special i2004
ID string.

class "i2004-clients"

{

        match if option vendor-class-identifier =
4e:6f:72:74:65:6c:2d:69:32:30:30:34:2d:41:00;

}


# Declaring another class for PC clients

class "pc-clients"

{}


# Declaring a shared network

# This is to accommodate two different subnets on the same
```

```
# physical network; see dhcpd.conf.man5 for more details


shared-network "myNetwork"

{

        # Declaring subnet for current server

        subnet 47.147.77.0 netmask 255.255.255.0

        {}


# Declaring subnet for DHCP clients

        subnet 47.147.75.0 netmask 255.255.255.0

        {

        # Pool addresses for i2004 clients

        pool

        {

        allow members of "i2004-clients";

        range 47.147.75.60 47.147.75.65;


        option routers 47.147.75.1;


        # Nortel Networks special string

        option nortel-specific-info = “Nortel…”;

}
```

default-lease-time 180;

max-lease-time 300;

}

}

Finally, before starting the server, create a blank dhcpd.leases file in the /etc directory: the same location as the dhcpd.conf file. Then to start the server, go to /var/usr/sbin/ and type:

./dhcpd

To run in debug mode, type:

./dhcpd –d –f

End of Procedure

Installing and configuring a Solaris 2 server

Installing a Solaris 2 Server

To setup the Solaris 2 server consult the accompanying manual and online documentation.

Configuring a Solaris 2 server

Use Procedure 52 on page 307 to configure Solaris 2 with DHCP.

Procedure 52
Configuring a Solaris 2 server

1 Read the man pages listed below:

- dhcpconfig
- dhcptab
- in.dhcpd

Note: There are directions at the end of each page referring to other sources that may be helpful.

2 Collect information about the network such as subnet mask, router/gateway and DNS server IP addresses as specified. Make sure this information is current.

3 Logon as **root** and invoke the interface by typing dhcpconfig at the prompt. A list of questions will be presented and the administrator must supply answers, which are then used to configure the DHCP server.

Note: Solaris 2 uses a text-based interface for configuring DHCP services.

End of Procedure

Procedure 53
Configuring Solaris 2 to Work with I2004

1 Create a symbol definition for defining a Site Specific option by typing the following in the dhcptab configuration table located at /etc/default/dhcp:

NI2004 s Site,128,ASCII,1,0

Or

2 Use the dhtadm configuration table management utility by typing the following command at the prompt:

dhtadm -A -s NI2004 –d 'Site,128,ASCII,1,0'

where,

NI2004: symbol name

s: identify definition as symbol

Site: site specific option

128: option code

ASCII: data type

1: granularity

0: no maximum size of granularity, i.e. infinite

3 Create a Client Identifier macro by typing in the following:

Nortel-i2004-A m:NI2004="Nortel…":

Or

4 Use the dhtadm command:

dhtadm -A -m Nortel-i2004-A -d ':NI2004="Nortel…":'

5 Invoke the DHCP services on the Solaris server by typing at the prompt.:

in.dhcpd,

Specify –d and/or –v options for debug mode. See man page in.dhpcd for more details.

End of Procedure

An example of the tables used in this project is as follows:

DhcptabTable

Locale m :UTCoffst=18000:

nbvws286 m
:Include=Locale:LeaseTim=150:LeaseNeg:DNSdmain=ca.nortel.com:/

DNSserv=47.108.128.216 47.211.192.8 47.80.12.69:

47.147.75.0 m :NISdmain=bvwlab:NISservs=47.147.64.91:

47.147.64.0 m
:Broadcst=47.147.79.255:Subnet=255.255.240.0:MTU=1500:/

Router=47.147.64.1:NISdmain=bvwlab:NISservs=47.147.64.91:

#

NI2004 s Site,128,ASCII,1,0

Nortel-i2004-A m
:NI2004="Nortel-i2004-A,47.147.75.31:4100,1,5;47.147.77.143:4100,1,5.":

Network Table

01006038760290 00 47.147.65.198 47.147.74.36 944600968
nbvws286

0100C04F662B6F 00 47.147.65.199 47.147.74.36 944600959 nbvws286

Format of ITG Line 2.1 Card Information

For the proper format of encoding the ITG Line 2.1 card information consult the Functional Specification or see the excerpt below.

DHCP Support for i2004

DHCP support in the i2004 terminal requires sending a "Class Identifier" option with each DHCP Discovery and Request message. Additionally, the i2004 checks for either a Vendor Specific option message with a specific, unique to Nortel i2004, encapsulated sub-type OR a site specific DHCP option.

In either case, a Nortel i2004 specific option must be returned by the i2004 aware DHCP server in all Offer and ACK messages. The i2004 will use the information returned in this option to configure itself for proper operation. This includes binding a new IP address, netmask and gateway (for local IP stack) as well as configuring Server 1 (minimum) and, optionally Server 2. By default, Server 1 is always assumed to be the "primary" server after a DHCP session.

The i2004 will not accept any Offers/Acks if they do not contain:

- A Router option (i2004 needs a default router to function) AND
- A Subnet Mask option AND
- Either:
- A Vendor Specific option as specified below OR,
- A site specific option as specified below.

Note 1: The initial DHCP implementation required only the Vendor Specific encapsulated sub-option. In inter-op testing with WinNT (up to SR4), however, it was discovered that WinNT does not properly adhere to RFC 1541. As a result it is not possible to use this option. The implementation was changed to add support for either Vendor Specific sub-ops or Site Specific options. This new extension has been tested and verified to work with WinNT.

Note 2: The site-specific options are all DHCP options between 128 (0x80) and 254 (0xFE). These options are reserved for site specific use by the DHCP RFCs.

Format for Nortel Networks i2004 Terminal DHCP Class Identifier Field

All i2004 terminals fill in the Class ID field of the DHCP Discovery and Request messages with:

"**Nortel-i2004-A**", where:

- ASCII encoded, NULL (0x00) terminated
- unique to Nortel i2004
- "-A" uniquely identifies this version.

Format for Nortel Networks i2004 Terminal DHCP Encapsulated Vendor Specific Field

This sub-option must be encapsulated in a DHCP Vendor Specific Option (Refer to RFC 1541 and RFC 1533) and returned by the DHCP server as part of each DHCP OFFER and ACK message in order for the i2004 to accept these messages as valid.

The i2004 will pull the relevant information out of this option and use it to configure the IP address etc. for the primary and (optionally) secondary TPS's.

Note 1: Either this encapsulated sub-option must be present OR a similarly encoded site-specific option must be sent (see below), i.e. configure the DHCP server to send one or the other - not both.

Note 2: The choice of using either Vendor Specific or Site Specific options is provided to allow WinNT DHCP servers to be used with the i2004 (WinNT servers do not properly implement the Vendor Specific Option and as a result, WinNT implementations must use the Site Specific version).

Format of the Encapsulated Vendor Specific Sub-option field

- **Type (1 octet)**. 5 choices: 0x80, 0x90, 0x9d, 0xbf, 0xfb (128, 144, 157, 191, 251). Providing a choice of five types allows the i2004 to work in environments where the initial choice may already be in use by a different vendor. Pick only one TYPE byte.

- **Length (1 octet)**: variable - depends on message content.
- Data (length octets): ASCII based with the following format:

  "Nortel-i2004 A,iii.jjj.kkk.lll:ppppp,aaa,rrr;iii.jjj.kkk.lll:pppp,aaa,rrr."

  where:
  "Nortel-i2004-A" - uniquely identifies this as the Nortel option
  "-A" signifies this version of this spec. Future enhancements could use "-B".
  ASCII "," is used to separate fields
  ASCII ";" is used to separate Primary from Secondary server info
  ASCII "." is used to signal end of structure
  "iii.jjj.kkk.lll:ppppp" - identifies IP:port for server (ASCII encoded decimal)
  "aaa" - identifies Action for server (ASCII encoded decimal, range 0..255)
  "rrr" - identifies retry count for server (ASCII encoded decimal, range 0..255). This string may be NULL terminated although the NULL is not required for parsing.

Note 1: "aaa" and "rrr" are ASCII encoded decimal numbers with a range of 0..255. They identify the "Action Code" and "Retry Count", respectively, for the associated TPS server. Internally to i2004 they will be stored as 1 octet (0x00..0xFF). Note that these fields must be no more than 3 digits long.

Note 2: The first server is always considered "Primary"; second server always considered "Secondary".

Note 3: If only one server is required, terminate primary TPS sequence immediately with "." instead of ";" e.g.
"Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr."

Note 4: Valid options are one server or two servers (0, 3... not allowed).

Note 5: Action code values:
0 - reserved
1 - UNIStim Hello (currently only this type is a valid choice)
2..254 - reserved
255 - reserved

Note 6: iii,jjj,kkk,lll are ASCII encoded, decimal numbers representing the IP address of the server. They do not need to be 3 digits long as the **.** and **:** delimiters will guarantee parsing. For example, '001', '01' and '1' would all be parsed correctly and interpreted as value 0x01 internal to the i2004. Note that these fields must be no more than 3 digits long each.

Note 7: ppppp is the port number in ASCII encoded decimal. It does not need to be 5 digits long as the **:** and **,** delimiters will guarantee parsing. For example, '05001', '5001', '1', '00001' would all be parsed correctly and accepted as correct. The valid range is 0 to 65535 (stored internally in i2004 as hexadecimal in range 0..0xFFFF). Note that this field must be no more than 5 digits long.

Note 8: In all cases, the ASCII encoded numbers are treated as decimal values and all leading zeros are ignored. More specifically, a leading zero does not change the interpretation of the value to be OCTAL encoded. For example, 0021, 021 and 21 are all parsed and interpreted as decimal 21.

Format for Nortel Networks i2004 Terminal DHCP Site Specific Option

This option uses the "reserved for site specific use" DHCP options (number 128 to 254 - Refer to RFC 1541 and RFC 1533) and must be returned by the DHCP server as part of each DHCP OFFER and ACK message for the i2004 to accept these messages as valid.

The i2004 pulls the relevant information out of this option and uses it to configure the IP address and so on for the primary and (optionally) secondary TPS's.

> ***Note 1:*** Either this site specific option must be present or a similarly encoded vendor-specific option must be sent (as described above). For example, configure the DHCP server to send one or the other - not both.

> ***Note 2:*** The choice of using either Vendor Specific or Site Specific options is provided to allow WinNT DHCP servers to be used with the i2004 (WinNT servers do not properly implement the Vendor Specific Option and as a result, WinNT implementations must use the Site Specific version).

Format of the DHCP Site Specific field

- **Type (1 octet)**: 5 choices 0x80, 0x90, 0x9d, 0xbf, 0xfb (128, 144, 157, 191, 251). Providing a choice of five types allows the i2004 to work in environments where the initial choice may already be in use by a different vendor. Pick only one TYPE byte.
- **Length (1 octet)**: variable - depends on message content.

- **Data (length octets)**. ASCII based format:

  "Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr;iii.jjj.kkk.lll:pppp,aaa,rrr."
  where:
  "Nortel-i2004-A" - uniquely identifies this as the Nortel option
  "-A" signifies this version of this spec. (Future enhancements could use "-B" for example.)
  ASCII "," is used to separate fields
  ASCII ";" is used to separate Primary from Secondary server info
  ASCII "." is used to signal end of structure
  "iii.jjj.kkk.lll:ppppp" - identifies IP:port for server (ASCII encoded decimal)
  "aaa" - identifies Action for server (ASCII encoded decimal, range 0..255)
  "rrr" - identifies retry count for server (ASCII encoded decimal, range 0..255). This string may be NULL terminated although the NULL is not required for parsing.

  Note 1: "aaa" and "rrr" are ASCII encoded decimal numbers with a range of 0..255. They identify the "Action Code" and "Retry Count", respectively, for the associated TPS server. Internally to i2004 they will be stored as 1 octet (0x00..0xFF). Note that these fields must be no more than 3 digits long.

  Note 2: The first server is always considered "Primary", and the second server is always considered "Secondary".

  Note 3: If only one server is required, terminate the primary TPS sequence immediately with "." instead of ";". For example:
  "Nortel-i2004-A,iii.jjj.kkk.lll:ppppp,aaa,rrr."

  Note 4: Valid options are one server or two servers (0, 3... are not allowed).

  Note 5: Action code values:
  0 - reserved
  1 - UNIStim Hello (currently only this type is a valid choice)
  2..254 - reserved
  255 - reserved

Note 6: iii,jjj,kkk,lll are ASCII encoded, decimal numbers representing the IP address of the server. They do not need to be 3 digits long as the **.** and **:** delimiters will guarantee parsing. For example, '001', '01' and '1' would all be parsed correctly and interpreted as value 0x01 internal to the i2004. Note that these fields must be no more than 3 digits long each.

Note 7: ppppp is the port number in ASCII encoded decimal. It does not need to be 5 digits long as the **:** and **,** delimiters will guarantee parsing. For example, '05001', '5001', '1', '00001' would all be parsed correctly and accepted as correct. The valid range is 0 to 65535 (stored internally in i2004 as hexadecimal in range 0 to 0xFFFF). Note that this field must be no more than 5 digits long.

Note 8: In all cases, the ASCII encoded numbers are treated as decimal values and all leading zeros are ignored. More specifically, a leading zero does not change the interpretation of the value to be OCTAL encoded. For example, 0021, 021 and 21 are all parsed and interpreted as decimal 21.

List of terms

Active Leader

The Leader that at a given instant of time is performing the Leader role of being the designated point of contact in the group of Follower cards for all the Meridian/Succession CSE 1000 systems in the network. The active leader card also provides endpoint management including registration/unregistration, authentication, address resolution (DN to IP and endpoint to gateway), and maintaining a list of endpoints currently active on the network.

Backbone

A network's major transmission path, handling high-volume, high-density traffic.

Bandwidth

A measure of information carrying capacity available for a transmission medium, expressed in bits per second. The greater the bandwidth, the more information that can be sent in a given amount of time.

BootP

Bootstrap Protocol. Protocol used for communication between ITG cards. A protocol that allows network hosted systems to determine their IP address and other operational information via a simple datagram exchange with a central server.

Bridge

LAN equipment providing interconnection between two networks using the same addressing structure. A bridge filters out packets that stay on one LAN and forwards packets intended for other LANs.

CD-ROM

Compact Disk - Read Only Memory.

CDP

Coordinated Dialing Plan.

CLS

Class of Service.

CO

Central Office.

Codec

Equipment or circuits that digitally code and decode voice signals. The ITG Line 2.1 card product uses the G.729 Annex AB codec.

Communications protocol

A set of agreed-upon communications formats and procedures between devices on a data communications network.

CPU

Central Processing Unit.

Data communications

Processes and equipment used to transport signals from a data processing device at one location to a data processing device at another location.

DHCP

Dynamic Host Configuration Protocol. Provides a mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.

DSP

Digital Signal Processor.

ESN

Electronic Switched Network.

ELAN

Emulated Local Area Network. This is the imbedded LAN.

EXUT

Enhanced Extended Universal Trunk card (analog trunk).

FNP

Flexible Numbering Plan.

Follower card

An ITG Line 2.1 card which has no specific role other than providing gateway functionality. See also *Gateway*.

Full-duplex transmission

Simultaneous two-way independent transmission in both directions.

Gateway

Gateways in the system contain two interfaces: one interface to the Meridian/Succession CSE 1000, and the other to the IP network. The gateway provides the necessary conversion for both call signalling and voice stream/packets across the two interfaces. The gateway functionality on the ITG platform is provided by the ITG Line 2.1 cards.

G.729AB

A codec supported by ITG that provides near toll quality at a low delay. Uses compression to 8 kpbs (8:1 compression rate).

GW

Gateway.

Hub

Center of a star topology network or cabling system.

IP

Internet Protocol.

Installation Summary Sheet

A sheet used during IP Telephony Gateway Line 2.0 card installation to summarize and record important information about cards.

LAN

Local Area Network. Data-only communications network confined to a limited geographic area, with moderate to high data rates. Contrast with WAN.

Latency

The amount of time it takes for a discrete event to occur.

Leader card

An ITG Line 2.1 card which is a designated point of contact, in the group of Follower cards and the backup Leader, for all the Meridian/Succession CSE 1000 systems in the network. See also *Active Leader*, *Backup Leader*, *Leader 0*, and *Leader 1*.

Leader 0

The Leader 0 card is the Meridian Administrative Tools (MAT) term for the ITG Line 2.1 card that initially assumes the active Leader role. See also *Active Leader*, *Backup Leader*, and *Leader 1*.

Leader 1

The Leader 1 ITG card is the MAT term for the ITG Line 2.1 card that initially assumes the backup Leader role. See also *Active Leader*, *Backup Leader*, and *Leader 0*.

MAT

Meridian Administration Tools. MAT is a Windows 95/98 and Windows 4.0 Workstation application that configures Meridian/Succession CSE 1000.

Mbps

Mega-bits per second. Millions of bits per second.

MDF

Main Distribution Frame.

Modem

Device that converts serial digital data from a transmitting terminal to an analog signal for transmission over a telephone channel, and another modem reconverts the signal to serial digital data for the receiving terminal.

MOS

Mean Opinion Score. MOS value reflects the customer opinion of voice quality and ranges from 0 to 5, where 0 means bad quality and 5 means excellent voice quality.

MTBF

Mean Time Between Failure. A measure of reliability: the time that a user can reasonably expect a device or system to work before an incapacitating fault occurs. Also, the average number of hours between one random failure and the next under stated conditions.

NANP

North American Numbering Plan.

Noise

Random electrical signals, generated by circuit components or by natural disturbances, that corrupt communications.

NPA

Numbering Plan Area.

NXX

Numbering Plan Exchange (Central Office).

OA&M

Operations, Administration, and Maintenance.

Packet

Group of bits transmitted as a complete package on a packet-switched network.

Packet switched network

A telecommunications network based on packet switching technology, where a link is occupied only for the duration of the transmission of the packets.

PCMCIA

Personal Computer Memory Card International Association. This organization has defined a credit card sized plug-in board for use in PCs. Application software can be stored on the card into system address space so that the software can run directly from the card, resulting in a faster start and less memory required from the host computer.

PPP

Point-to-point protocol. A TCP/IP routing protocol for communications over serial lines without intervening adapters, such as modems.

PSTN

Public Switched Telephone Network.

QoS

Quality of Service.

RAS

Registration, Admission, and Status.

RTT

Round Trip Time.

SNMP

System Network Management Protocol. Protocol used to communicate MAT ITG alarms or events.

Subnet

Means of splitting packets into two fields to separate packets for local destinations from packets for remote destinations in TCP/IP networks. This makes small networks more efficient.

TCP/IP

Transmission Control Protocol/Internet Protocol. Protocol for internetwork routing and reliable message delivery.

Telnet

Standardized application providing a terminal interface between nodes, using the TCP/IP network protocol.

Terminal

Device capable of sending or receiving data over a data communications channel.

Throughput

Indicator of data handling ability. Measures how much data is processed as output by a computer, communications device, link, network, or system.

TLAN

Telephony Local Area Network. Also referred to as the Voice LAN.

Topology

Logical or physical arrangement of nodes or stations.

UDP

1. Uniform Dialing Plan. A dialing plan supported by ITG.
2. User Datagram Protocol. ITG sends signaling and voice over a TCP/IP and UDP/IP signaling stack.

Voice compression

Method of minimizing bandwidth by reducing the number of bits required to transmit voice.

VoIP

Voice over IP. Used synonymously with XoIP.

XoIP

Voice or Fax over IP.

WAN

Wide Area Network. Network using common carrier-provided lines that covers an extended geographical area. Contrast with LAN.

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X

Meridian/Succession CSE 1000 ITG Line 2.1/i2004 Internet Telephone

Description, Installation, and Operation

Information is subject to change without notice. Nortel Networks reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the limits of a Class A digital device pursuant to Part 15 of the FCC rules and the radio interference regulations of Industry Canada. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
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